GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

The Coking of Coal.

TECHNICAL bees buzz right merrily around this topic, which, with all fairness and deference to scientific investigators, is in its teething stage. No one yet quite knows, in fact, whether the child is white or black; and this accounts for much argument "about it and about." At the same time, it cannot be said that investigators "ever more come out by the same door as in they went." Thanks to the fascination which the subject of coking exercises on scientific minds, much knowledge is being gained internationally every day, and it may not be long before an official pronouncement will be made as to the precise nature of the child.

In the meantime, illogical as it may appear, its training is in full harness. Blending of coals is one form of training; and as an example of the efficacy of this method of teaching the child the way it should go, mention may be made of the work of Audibert and Delmas, who, using two coals, a Silesian coal which was quite non-agglutinating and a Lens coal which intumesced to form a spongy, soft coke, obtained by blending a series of cokes of crushing strength up to 500 kg. per sq. cm. Another form of training was dealt with recently by Dr. Lander, who announced that a coal devoid of coking power, when powdered and given "a comparatively mild treatment "with hydrogen, came out of the bomb as a hard, pitch-"like material which, when carbonized, makes a hard, "swollen coke. In fact, it gives a hard, compact coke if "mixed with two or three times its own weight of the "original non-coking coal." Further, it is stated that a coking coal has been oxidized so as to lose its coking power completely, and has then been hydrogenated back to its original coking power. It is claimed that even anthracites can be converted into coking coals, and that similar results can be obtained using water gas instead of hydrogen.

Both the foregoing examples of training are taken from a most valuable paper by Mr. M. Barash, of West's Gas Improvement Company, Ltd., before the Society of Chemical Industry at their annual meeting in Manchester last week, the first instalment of which will be found on later pages of this issue. For over ten years Mr. Barash has devoted his energies largely to an attempt to elucidate the nature of coking; and the information regarding his work, and the expression of the views which this work has led him to take, are of great importance. Incidentally the value of his paper is enhanced by a markedly fair and clearly stated review of the work of others in the same field. Both as an original research worker and as a shrewd critic and reviewer, Mr. Barash will already have commended himself to our readers through his contributions to the "JOURNAL" during the past few years. His prize-winning essay in the Coke Competition organized by the "JOURNAL" four years ago stands on record as a work of reference, and his present paper will share an equally respectful fate.

Without in any way attempting to criticize his findings, we set them out briefly here: That portion of coal soluble in pyridine and chloroform is the cementing material to which is mainly attributable the coking properties of coal; of this portion, that soluble in pyridine but unsoluble in chloroform contributes to an appreciable extent towards these properties; the manifestation of these properties is influenced to a very marked degree by the type and condition of the infusible matter of coal (insoluble in pyridine); weathering or treatment which reduces the coking power effects the change through modification of the infusible matter; the difference between highly coking and non-coking coals depends essentially on the physical condition of the infusible compounds, and only to a limited extent on the amount of agglutinant present.

Further Facts on Gas Drying.

NEW information on a subject of current interest and great importance is given by Mr. S. E. Whitehead, of Portsmouth, in our issue to-day. He gives the experience of a "Dri-Gas" plant of a capacity of 6 to 7 million c.ft. of gas per diem which has been in operation at the Hilsea Works of the Portsmouth Gas Company for nearly two years. The plant is positioned between the station meters and the holders; and the author cites reasons for his preference for installation at this point. First, the plant is smaller, because there is a vast difference between maximum make and maximum output; secondly, conditions of gas flow being more regular, greater uniformity and efficiency of the drying process are gained; thirdly, there is absence of additional back-pressure between holders and station governors, which constitutes an important advantage where there is no boosting plant; finally, the holders are protected against internal corrosion. The advantage of the alternative arrangement appears to be that no oil film is needed, and this may be of some moment when appearance of holders is a consideration of importance. Need for worry regarding this, of course, disappears automatically with the erection of the waterless holder.

The "Dri-Gas" plant at Hilsea treats 65 p.ct. of the total make of gas, and no serious trouble has been experienced in its working, which is "simple and automatic." At times deposits of calcium carbonate on the

tubes of the concentrators have resulted in back-pressure; but these deposits have been easily removed. In the "Journal" for Jan. 25 of last year, it was noted that Mr. F. W. Sperr, Director of Research at the Koppers Company Laboratory, suggested that "it is easily conceivable that the increased corrosion caused by minute amounts of calcium chloride spray which may be deposited in the mains would more than offset any reduction effected by the removal of water." On this matter, the remarks of Mr. Whitehead are of great interest. After eighteen months' working, a portion of the steel main at the outlet of the drying washer was cut away; and neither the main nor the cast-iron parts of the outlet valve showed signs of corrosion. Altogether the results at Portsmouth have been entirely satisfactory. Complaints of water in mains and services have been reduced by 74 p.ct.—a beneficial effect most marked during the severe frost last February, when those districts supplied with dry gas enjoyed freedom from frozen lamp services; there has been a valuable reduction in syphon pumping charges, and no deleterious action of the dry gas on meters has yet been discovered; also, the drying process has resulted in a far higher efficiency of the naphthalene washer, a reduction of 40 p.ct. on the oil used having been effected. Finally, the cost of drying at Portsmouth, at 0·026d. per therm, is negligible. This, as stated, is with a plant of 6 to 7 million c.ft. daily capacity; but figures already published for plants of about 1 million c.ft. capacity per diem show that even for comparatively small works the cost item is not one to give rise to any misgiving.

The Small Capitalist.

On more than one occasion in recent months there has been made in these columns an earnest appeal for the safeguarding of the small investor; and our estimate of the importance of the subject is such that we offer no excuse for returning to it now. The appeal is one that may spring from the heart or the brain, and at this moment it comes from both.

Last year we witnessed extraordinary activity in the company promoting world, when chaff was liberally mixed with the wheat; when the "get-rich-quick" fever rose to its highest pitch. In the huge fleet that was launched upon the uncertain seas of joint-stock enterprise, there were vessels of every kind. All pretty to look at, perhaps; but what is mere beauty in a ship that has to withstand the storm of competition; to steer clear of the rocks of finance; to avoid possibly many other dangers undreamed of at the start? Some were doomed even before they left port; many were destroyed by forces which they were not equipped successfully to overcome; others which remained afloat were hopelessly waterlogged. A great number, of course, were thoroughly seaworthy boats, rising and falling with each wave, and in no danger of foundering; but it is not these we have in mind. They have done much to offset the failures; but fabulous sums must have been lost, and by whom? Mostly not by the initiated—they are more or less able to take care of themselves—but by the uninitiated. Those who studied such matters noted towards the end of the new-issue "boom" the large proportions of capital frequently left on the hands of the underwriters; and it is perfectly safe to assume that without the help of the uninitiated many of the companies would never have been launched at all.

"Boom" conditions have long since passed away; but there has been a great deal of wreckage left behind, and the warning to the small capitalist to exercise extreme care in the nature of his investments remains as essential as ever it was. More than one way may be found of issuing such a warning. Now that the gas companies' meetings are so generally reported in the Newspaper Press, the remarks of the Chairmen reach a far wider circle than the small percentage of shareholders who may be able to attend the meeting. This, of course, is not the season of the year for many of these gatherings; but another avenue which suggests itself is the House Organ, the prevalence of which in our industry is steadily increasing. These offer an even better means of appealing to the person of small means who cannot afford to accept risk in his investments. But whatever the method selected, see that the thing is done thoroughly. It was remarked on many occasions during last year's Stock Exchange activity that quite a "new class" was taking an interest in financial affairs. This means that the participants were inexperienced, and therefore that many of them came from the ranks of the small capitalist. How many of this "new class" must now be sorry that they ever took part in the movement, and what hardship must have been the price paid by them for a bitter lesson!

We are anxious, on behalf of those who are least able to judge for themselves in these matters, that every effort should be made to prevent the number of unfortunates being further added to. It is an effort that is well worth while. Nay, more, we hold it to be vital to the country's welfare.

Refractories.

The owner of a wireless set is not as a rule vitally interested in the particular circuit of his receiver; and there is no reason why he should be. What he regards as important is the purity of the sound which emanates from the speaker. Similarly we have yet to discover a reason why the gas engineer should spend a great deal of time studying the type of apparatus used by a particular investigator to determine the temperature at which a refractory brick undergoes a change in crystal structure. What he is concerned about is what happens to the brick; and when this is set out clearly and simply by the specialized scientist, so much the better. The value of a research report should on no account be judged by its length. In common with most other laymen, we are content to believe that the research workers are meticulously careful in their experiments, and sufficiently alive to the fact that a record must be kept of their detail work for the benefit of others engaged in the same field; but, while having this faith in our scientists, we ask for a simple statement of what has been discovered, not of how it has been discovered. In the same way, without pretence of mathematical knowledge, we hope, without the aid of calculus, to gain some understanding of Einstein's philosophy.

Admittedly the foregoing is a preamble which may be considered by some as not only lacking in good taste, but savouring of flippancy. Yet we think the idea fully justified. It has been brought to birth by this year's publication of the Report of the Refractory Materials Joint Committee of the Institution of Gas Engineers, which, in spite of the fact that its length is negligible in comparison with the plethora of detailed communications of yore, is equally valuable to the man who has to apply the results of research work. To-day we publish the paper by Mr. A. J. Dale and Mr. F. Wheeler on "Some Effects of Temperature on Commercial Heat-Insulating Bricks;" and on a future occasion we shall publish the communication by Messrs. Dale, H. T. S. Swallow, and Wheeler on "The After-Expansion and True Specific Gravity of Silica Refractories for Carbonizing Plant."

Both are important, and both are short. The former shows clearly that heat economy must be balanced against the cost of renewals, and that the refractoriness of the material itself must be considered; while the latter gives the results of a number of experiments conducted at the request of the Committee. After careful consideration, the Committee do not think it advisable to introduce a test for specific gravity into the Standard Specification. Messrs. Dale and Wheeler state that, before applying any type of heat insulation within the bounding walls of a high-temperature structure, it is most desirable to know the temperature distribution through the wall. The insulating blanket can then be placed at a position which contraction test or low-load test data indicate as being suitable for the material. Satisfactory compromise between thermal economy and structural stability should be possible as the result of laboratory testing.

The report includes an account of the work on "The Influence of Oxidizing and Reducing Atmospheres on Refractory Materials," by Mr. Swallow. This work has revealed many points of interest in relation to the adverse influence of reducing gases, and particularly of steam; and it has also established that refractories are easily

obtainable which, with suitable design of furnace, render such adverse influence of almost negligible importance in retort furnaces. Mr. Dale and Mr. V. Hackney have considered the surface flaking of vertical retorts, and state that a likely cause is the surface strain developed during the incandescent combustion of the scurf; this strain being the result of the conversional expansion of the brickwork at high temperatures and the contractile tendency of the scurf. In some cases slower scurfing and a little more use of the rod may be an advantage. Messrs. Dale and Hackney also discuss the question of hot-patching cements; attention being directed to the value of cellulose lacquer as a plasticizer for such mixtures. For silica cements, as much as 7 p.ct. of powdered bottle glass may be incorporated with advantage. A series of actual works trials on carbonizing plant should yield valuable information.

The Growth of Co-Partnership.

On a later page will be found an interesting table showing the present position of co-partnership in the gas industry. At the end of last year, fifty-two companies had co-partnership or profit-sharing schemes in operation; the number of employees participating amounted to 42,058; and the value of the shares and deposits held by employees was £2,629,400. Co-partnership in our industry has progressed further than in any other; and it is interesting to record the growth in the number of undertakings working with co-partnership or profit sharing as a basis. The figures for the years 1911, 1919, and 1927 are respectively 25, 33, and 49. The corresponding figures for firms outside the industry are 36, 53, and 86. In the year 1927, the total value of shares held by employees other than directors was £6,318,000. In the June issue of "Co-Partnership," the organ of the Industrial Co-Partnership Association, an interesting comparison is drawn between twenty gas companies and forty firms exclusive of the gas industry, in regard to the relation of wage-earning to salary-earning employee-shareholders. The average holding of the wage-earner in the gas industry is £52, and in outside firms £41. On the other hand, the figures for salary-earners are £149 and £156 respectively. The number of wage-earner shareholders is practically the same in both cases, but, while there are only 1545 salary-earner shareholders in the gas industry, there are no fewer than 10,768 in the outside firms.

Low-Temperature Carbonization at Richmond.

Speaking at a gathering of the Coal Trade Luncheon Club, Sir David Milne-Watson, Governor of the Gas Light and Coke Company, referred to the low-temperature carbonization plant which, as our readers are aware, his Company have installed at their Richmond Works. Shortly the whole of the works will be devoted to the production of gas by low-temperature methods. "It is," said Sir David, "rather early yet to say what the results will be, but it is obvious that the Gas Light and Coke Company are not going to make a fortune out of Richmond. It is, however, all to the good that the gas industry, which is absolutely open-minded on this question of low-temperature carbonization, should be taking part in this investigation."

Reading the Meter.

The New Orleans Public Service recently entered upon an elaborate and extensive plan for teaching their customers to read their meters, in the hope that, by arming them with the knowledge of how to check the amount of gas and electricity consumed in a certain definite period of time, the possible idea that they were paying for something they did not get would be eliminated, and one of the greatest causes of misunderstanding would thus disappear. A meter reading school was equipped, and instruction booklets were prepared. The idea was received with overwhelming enthusiasm on the part of the consumers. On the opening day approximately 800 persons had their first lesson in meter reading, and about 750 booklets were distributed. There was subsequently an extensive advertising campaign. Mr. Barnes (Director of Advertising for the New Orleans Public Service Inc.), in putting forward the facts, remarks that whether or not this knowledge, once gained, will be put into practice in actually checking the consumption of gas and electricity each month remains to be seen. We should imagine that it will depend to some extent upon the accessibility of the meter. Should a pair of steps and an electric torch be necessary for an inspection of the dial, the enthusiasm of the consumer for his self-imposed task may soon flicker out. But perhaps the New Orleans Public Service have incorporated with their consumer meter-reading campaign an instruction to their service staff to fix meters "who runs may read," without any possibility of risk to life or limb.

Creating Confidence.

The idea of inducing consumers, as the New Orleans Public Service are doing, to concern themselves with their gas meters is one which has always appealed to us. It is by no means invariably the case that "familiarity breeds contempt;" and in the case of the gas meter the opposite is far more likely to be true. The meter is a scientific instrument of extraordinary exactitude in operation, well designed and accurately made, regard for which must increase upon closer acquaintance. It is of things which are not properly understood that the public are mainly inclined to feel suspicious; and the gas meter was too long invested with an air of mystery. In reality it is in every way a worthy servant; and good work is done by those undertakings which assist the consumers to so look upon it. The reading of a meter is not difficult; and it is a practice which in these days, when gas is used for such a variety of purposes, may be interesting, and is certainly desirable.

The Railway Wagon Discussion.

In connection with the lively discussion that has been taking place on the subject of the desirability or otherwise of making general use of high-capacity railway wagons, it is of interest to note the statement, arising out of the last meeting of the Central Executive Board of the National Gas Council, that the Committee which was appointed by the Board to consider this question had approved a memorandum which had been forwarded to the Government Standing Committee. The memorandum expressed the view that there should in future be two standard sizes of wagon (namely, 20-ton and 12-ton wagons), the 20-ton wagon to be used at the option of the consumer, and, further, that in the case of 20-ton wagons the Railway Company should offer a sufficiently attractive rebate in railway rates for both haulage and hire to allow for all additional costs, including maintenance. The view was also expressed that no system of district pooling of wagons should be introduced at the present time, nor until standardization, if adopted, had been in practice for a number of years.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

July 24.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, at 2.30 p.m.

July 25.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—Meeting in the Gas Offices, Bute Terrace, Cardiff, 2.30 p.m.

July 31.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Aug. 13-14.—IRISH ASSOCIATION OF GAS MANAGERS.—Meeting in Dublin.

Sept. 12.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at St. Andrews.

Sept. 19.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—General Meeting at Porthcawl.

Oct. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Eastbourne.

PERSONAL.

Mr. J. F. Lord, formerly Engineering Assistant to the Northampton Gas Light Company, has been appointed Engineering and Second Assistant to Mr. A. E. Ruffhead, Engineer to the Gas Department of the Darlington Corporation.

We are pleased to note that Mr. William J. Grey, A.C.A., has now been appointed General Manager, in addition to being Secretary, of the Alliance and Dublin Consumers' Gas Company. Mr. Grey qualified as a member of the Institute of Chartered Accountants of England and Wales in 1909, and accepted the position of Secretary and Accountant to the Alliance and Dublin Consumers' Gas Company on the reorganization of the undertaking's affairs in 1914.

The employees of the Peterhead Corporation Gas-Works paid a high tribute to their Manager, Mr. William S. Easson, on the occasion of his leaving to succeed his father as Engineer and Manager of the Selkirk Gas-Works. Mr. John J. Sangster, the Assistant Manager, on behalf of the employees thanked Mr. Easson for his thoughtful consideration to them at all times, and spoke very highly of his ability, remarking that the town was losing one of its best officials, as he, Mr. Easson, was so very earnest and conscientious in his duties. Mr. Easson then received an umbrella and attaché case with the employees' best wishes for health, happiness, and prosperity. Mr. Easson, in replying, said he was sorry to leave the employees as they had been most loyal to him and their work, and no Manager could wish for a better staff. Mr. Easson was met in the Council Chambers on Tuesday, July 9, and presented with suitable gifts from the members of the Town Council and also from the officials. Provost Milne, who made the presentation, spoke highly of Mr. Easson and wished him every success. At a meeting of the Marshal Keith Lodge of Oddfellows, with which Mr. Easson and a number of the Gas-Work employees are associated, Mr. A. Ferguson handed Mr. Easson a fountain pen with the best wishes of his fellow members. Mr. Easson has acted as President of the Lodge, Order Executive Councillor, and Auditor during his stay in Peterhead, and was highly respected.

Writing in the current issue of the "Croydon Co-Partner," "W. A. B." tenders to Mr. Arthur Tennant the cordial congratulations of his colleagues upon his recent appointment as Sales Manager to the East Surrey Gas Company. Mr. Tennant entered the service of the Croydon Gas Company in May, 1910, and, after serving in the Distribution General Office for a number of years, was transferred to the Showrooms. He enlisted in the Signals Corps of the Royal Engineers on March 1, 1916, and was demobilized in September of 1919. On his return to civil life his activities were devoted to outdoor business production, and he made a marked success of the several special selling campaigns entrusted to him. Moreover, he did much to bring about cordial relations with the local builders. After serving for some time as the Company's Senior District Representative, he was recently given the position of Chief Assistant to the Sales Superintendent. "Mr. Tennant made himself extremely popular with the Company's customers," writes "W. A. B.," "and his colleagues in this Company will always remember him for his excellent work during his two and a-half years' editorship of the 'Co-partnership Magazine.'"

At the Brentwood Gas Company on June 21, a presentation was made to Mr. H. W. Woods, who is leaving the Company to take up an appointment as Distribution Superintendent to the Lowestoft Gas and Water Company. In making the presentation of a gold wristlet watch, suitably engraved, the General Manager, Mr. W. S. Venner, said he hoped Mr. Woods would accept it as a small token of their esteem, and he wished Mr. and Mrs. Woods every success in the future.

ON THE ELECTRICAL SIDE.

West Midlands Joint Electricity Authority.

The West Midlands Joint Electricity Authority have placed an order with the British Thomson-Houston Company, Ltd., of Rugby, for the complete electrical generating plant required for the first section of the new base load power station being erected at Ironbridge, on the River Severn. Included in the contract are a 50,000 kw. (67,000 h.p.) turbo-alternator, three 21,000 kva. outdoor type transformers, 33,000 volt switch-gear, and the necessary auxiliary equipments. The turbo-alternator consists of a 50,000 kw. maximum continuous rated two-cylinder double-flow steam turbine, with direct coupled three-phase 11,000 volt 80 p.ct. power-factor 50-cycle alternator, provided with "B.T.H." closed system air cooler. The turbine is designed for a steam pressure at the stop valve of 375 lbs. per sq. in. gauge, 750° Fahr. total temperature. Connected solid with the alternator are three "B.T.H." single-phase oil-immersed self-cooled outdoor type transformers arranged in delta on the primary side and in star on the secondary side, giving 33,000 volts between phases. These transformers are the largest self-cooled units ordered in this country for power station service. All switching is effected at 33,000 volts. The cooling water for the condensing plant will be taken from the River Severn; a separate pump house being erected on the river bank for this purpose.

Scheme for North-East England.

Details have now been published of the North-East England Electricity Scheme, which is the sixth to be prepared by the Electricity Commissioners. It embraces the counties of Northumberland and Durham and part of the North Riding of Yorkshire. This covers the area in which the Newcastle Electric Supply Company and associated undertakings have distribution rights. A number of isolated undertakings also operate in the area, which extends to over 5000 square miles and contains a population of something like 2¾ millions. For the purposes of the scheme, six stations will be selected, all owned by the Newcastle Company. Five other stations also are to be operated for a time, but will be closed-down before 1941. No new stations will be added. By about that time it is calculated that the consumption of electricity will have reached something like 660 units per head of population—much more than the average for the country as a whole. Electricity has, however, been greatly developed in the area, where large power-consuming industries predominate. An extension south from the North Tees station will link-up, through Scarborough, with the Mid-East England Scheme; while secondary lines operating at 33,000 volts will carry the system to Northallerton and Thirsk, and so bring it into connection with the Mid-East England Scheme again in the North Riding. It is anticipated that by 1941 the expenditure will have aggregated £11,500,000, and that the cost of electricity as generated in the selected stations will fall from 0·2956d. per unit in 1931-32 to 0·2809d. per unit in 1935-36.

Inventor of the Incandescent Lamp?

The rival claims on behalf of Edison and Swan in the matter of the invention of the incandescent electric lamp are discussed by Mr. Kenneth R. Swan in the pages of the "Electrician." The writer says: "It is no doubt the fact that on Oct. 21, 1879, Edison succeeded in getting an evacuated glass globe, in which was mounted a filament of carbonized cotton thread, to glow effectively for a few hours; and it is no doubt also the fact that he was the first in the United States to accomplish this feat. If, therefore, the American nation choose to commemorate this occasion as the birthday of the incandescent electric lamp in the United States, they can no doubt find ample justification for doing so. But if a broader claim than this is made the following facts should be brought to notice:

"In December, 1878, and in January and February, 1879, Joseph Wilson Swan (who had commenced to study the problem of incandescent electric lighting in 1848) publicly exhibited his incandescent carbon lamp, and demonstrated the practicability of electric lighting by this means to large numbers of people in Newcastle-on-Tyne, Gateshead, and Sunderland. The earliest date of these demonstrations was Dec. 18, 1878. The fiftieth anniversary of this occasion was commemorated by the Institution of Electrical Engineers at the veritable birthday of the incandescent electric lamp. Neither Swan's lamp as exhibited in 1878, nor Edison's as exhibited in 1879, had in its initial form all the necessary qualities of a commercially successful lamp. The first serviceable lamps made by Edison had filaments of bamboo. A few of these lamps were first seen in England in the spring of 1880. But even this form of filament, elegant and ingenious as it was, was not destined to achieve more than an ephemeral success. Early in 1880, Swan, who had been working to improve the filament, devised a means of producing carbon filaments of the required strength and uniformity. These filaments were known as parchmentized cotton filaments; and the first commercial manufacture of lamps in Great Britain, commenced in 1880, was based upon this improved filament. Edison quickly discarded his bamboo filament, and adopted the parchmentized cotton filament of Swan's invention. In 1883, Swan devised a further improvement—namely, what was known as the squirted filament. Cellulose in the form of nitro-cellulose or (according to a later modification) cellulose dissolved in chloride of zinc, was squirted through a small orifice, in the form of an endless thread. This was subsequently reduced to pure cellulose, then cut and shaped, and carbonized. This form of carbon filament, which immensely improved the efficiency of the lamp, superseded the parchmentized cotton filament, and resulted in greatly extended use of incandescent electric lighting."

NATIONAL GAS COUNCIL.

A Meeting of the Central Executive Board of the National Gas Council was held at No. 28, Grosvenor Gardens, S.W., on Tuesday, July 9.

CHAIRMAN AND VICE-CHAIRMEN.

Sir David Milne-Watson was unanimously elected Chairman of the Board for the present year, and the following were unanimously elected Vice-Chairmen: Alderman F. S. Phillips, Mr. William Cash, Mr. J. H. Ellis, and Mr. Frank H. Jones.

CENTRAL COLLIERIES COMMERCIAL ASSOCIATION.

It was reported that a request had been received from the Central Collieries Commercial Association that a conference should take place between members of the Council and representatives of their Association, for the purpose of discussing the coal position. The Board appointed representatives to attend the proposed conference at a date convenient to both sides.

AREA GAS SUPPLY COMMITTEE.

It was reported that a draft preliminary survey had been prepared on behalf of the Council, and authority was given for this to be forwarded to the Area Gas Supply Committee.

ROYAL COMMISSION ON TRANSPORT.

The Transport Committee of the Council had approved a memorandum which had been forwarded to the Federation of British Industries setting out the views of the Council with regard to the transport question.

RAILWAY WAGONS.

The Committee which was appointed by the Board to consider this question had approved a memorandum which had been forwarded to the Government Standing Committee. The memorandum expressed the view that there should in future be two standard sizes of wagon (namely, 20-ton and 12-ton wagons), the 20-ton wagon to be used at the option of the consumer, and, further, that in the case of 20-ton wagons the Railway Company should offer a sufficiently attractive rebate in railway rates both for haulage and hire to allow for all additional costs, including maintenance. The view was also expressed that no system of district pooling of wagons should be introduced at the present time, nor until standardization, if adopted, had been in practice for a number of years.

It was stated that the Transport Committee of the Federation of British Industries had co-opted a member of the Council on such Committee for the purpose of considering the replies received from the various Associations in connection with this matter.

POLLUTION SUB-COMMITTEE OF THE FEDERATION OF BRITISH INDUSTRIES.

A report had been received from the Federation of British Industries dealing with this matter, and a Committee was appointed to consider the question from the legal point of view.

JOINT GAS AND ELECTRICITY SUB-COMMITTEE.

It was stated that two meetings of this Sub-Committee had been held—viz., on June 4 and July 9.

CARBON MONOXIDE INQUIRY.

The question of the preparation of evidence to be given on behalf of the gas industry before the Committee recently appointed by the Board of Trade was referred to the Gas Safety Committee.

PATENT LAW REFORM.

A résumé was submitted of the report of the British Science Guild on this subject, and the Council intimated its general approval of the desirability of reform on the lines indicated in the report.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

THE anxiety over the possible increase in the Bank Rate was, with the influx of gold, soon dispelled last week, and the gilt-edged market became quite cheerful. War Loan was an outstanding feature, and the price quickly improved. As the price rose investment buying ceased, and there was a slight setback; but a substantial improvement was shown on the week.

The Industrial Market was quiet on the whole. Some excitement prevailed over the commencement of dealings in the new Cables and Wireless stocks, and there was a further recovery in Rubbers. Artificial Silks, however, were depressed on the reduced interim dividend announcement of Courtaulds.

The Gas Market is being influenced doubtless by the close proximity of the half-yearly dividend disbursements. Any stock coming into the market is speedily absorbed, and there is little on offer in the hands of the brokers. Prices remain steady, and, apart from the usual *ex* div. reductions at this time of year, there are few changes in the quotations. The principal item of interest last week was the announcement by the Imperial Continental Company of a supplemental allotment at the rate of £2 10s. of new stock per £100 of old stock which brought about a sharp rise in the quotation to 380-400. It will be noticed by the Stock and Share List appearing on another page that the Wandsworth Company's ordinary stocks are now quoted *ex* div. The Company is distributing the same dividend as for the December half-year—viz.: "A" Stock, £9 p.ct. p.a., June, 1929, against £8 15s. p.ct. p.a., June, 1928; "B" Stock, £7 10s. against £7 5s.; "C" and New Stock, £6 6s. against £6 2s. 6d.; Wimbledon Stock, £7 2s. 6d. against £6 17s. 6d.; Epsom Stock, £7 12s. 6d. against £7 7s. 6d.

The following transactions were recorded during the week:

MONDAY.—Alliance and Dublin 97½, Commercial 3 p.ct. deb. 57, European 17, Gas Light and Coke 18s. 7¼d., 18s. 9d., 18s. 10½d., 19s., 3½ p.ct. 63, 63¾, 4 p.ct. pref. 76¼, 3 p.ct. deb. 58¾, 60½, 5 p.ct. deb. 99⅝, 99¾, Imperial Continental 360, 364, 365, 365½, 366, 367, 3½ p.ct. deb. 71, Portsmouth 4 p.ct. 115, 116, 5 p.ct. max. 83, 83½, Primitiva 36s. 3d., 36s. 4½d., 36s. 6d., 36s. 7½d., 36s. 8¼d., 36s. 9d., 37s., 37s. 3d., 37s. 6d., South Metropolitan 104, 104¼, 3 p.ct. deb. 58⅜, South Suburban 5 p.ct. 107½, Tottenham 3½ p.ct. 108. Supplementary prices, British, Norwich 3 p.ct. deb. 53.

TUESDAY.—Alliance and Dublin 4 p.ct. deb. 67½, Bournemouth 6 p.ct. pref. 11, British 5 p.ct. deb. 96½, European 17, Gas Light and Coke 18s. 7¼d., 18s. 9d., 18s. 10½d., 19s., 4 p.ct. pref. 76½, 76⅜, 77½, Imperial Continental 362, 363, 366, 367, Newcastle 3½ p.ct. 17s., Oriental 118, Primitiva 36s. 9d., 37s., 37s. 3d., 37s. 6d., 37s. 9d., 38s., South African 5, South Metropolitan 104, 104¾, 3 p.ct. deb. 58¾, South Suburban 5 p.ct. 109, Tottenham 3½ p.ct. 107½. Supplementary prices, Croydon 7 p.ct. deb. 103½, Farnham 6 p.ct. pref. £10 16s. 9d., £10 18s., Mid-Kent 75s.

WEDNESDAY.—Alliance and Dublin 97, Bournemouth 6 p.ct. pref. 11⅞, British 4 p.ct. deb. 71½, European 16⅞, Gas Light and Coke 18s. 8¼d., 18s. 9d., 18s. 9¾d., 18s. 10½d., 19s., 3½ p.ct. max. 64, 4 p.ct. pref. 77¼, 77½, 3 p.ct. deb. 59, 5 p.ct. deb. 99⅝, 99¾, Imperial Continental 363, 364, 365, 365½, 368, 3½ p.ct. deb. 72, Primitiva 36s. 3d., 36s. 6d., 36s. 7½d., 36s. 9d., 37s., 37s. 1½d., 37s. 3d., 37s. 4½d., 37s. 6d., Tottenham 3½ p.ct. 107, Wandsworth, Wimbledon stock, 117. Supplementary prices, Brighton and Hove 6 p.ct. "B" pref. 105, Croydon 7 p.ct. deb. 103, Haslemere and District "B" 99½, 100, Liverpool 5 p.ct. 95.

THURSDAY.—Brighton and Hove 6 p.ct. 114, 5 p.ct. 101, European 16⅞, Gas Light and Coke 18s. 9d., 18s. 10½d., 19s., 19s. 1½d., 3½ p.ct. 63, 3 p.ct. deb. 59, 5 p.ct. deb. 99⅝, Imperial Continental 375, 376, 380, 381, 382, 383, 385, 388, 390, 392, 395, Primitiva 36s., 36s. 3d., 36s. 6d., 36s. 9d., 36s. 9¾d., 37s., South African 97s. 6d., South Metropolitan 104¼, 6 p.ct. pref. 111, Southampton 5 p.ct. 79, Tottenham 4 p.ct. deb. 74¼. Supplementary prices, Brighton and Hove 6 p.ct. "B" pref. 105, Haslemere and District "B" 99½, Montevideo new 21s. 7½d., 21s. 9d.

FRIDAY.—Bournemouth 6 p.ct. pref. 11⅛, Brighton and Hove 6 p.ct. 114, 115, 5 p.ct. 102, British 119¾, 5 p.ct. deb. 96½, European 16⅞, 17¼, Gas Light and Coke 18s. 10½d., 19s. 1½d., 3½ p.ct. 62¾, 4 p.ct. pref. 76½, 3 p.ct. deb. 59, 5 p.ct. deb. 99, Imperial Continental 383, 385, 388, 390, 391, 392, 393, 394, 397, 398, Primitiva 36s. 3d., 36s. 6d., 37s., 37s. 1½d., 37s. 3d., 37s. 6d., South Metropolitan 104, 104¼, 104⅜, 6 p.ct. pref. 109½, 6½ p.ct. deb. 101⅜, South Suburban 109, Southampton 5 p.ct. 79¾. Supplementary prices, Associated Gas and Electric "A" $55, Gas Light and Coke 7½ p.ct. Brentford bonds 101, South Shields 7 p.ct. 106¼, 106¾.

On the Foreign Exchange Market, the leading foreign currencies moved against sterling under the lead of the New York rate, which finished at 4.84 5/16. Continental buying contributed to the fall in the rate. French francs closed at 123.90; German marks at 20.36½; Belgas at 34.90¼; Dutch florins at 12.07 11/16; Spanish pesetas at 33.45; and Italian lire at 92.75½.

Silver was firm at 24 3/16d. per oz., and Gold, which had been down during the week, advanced ¾d. to 84s. 11¼d. per oz.

The Bank Rate is 5½ p.ct., to which it was raised from 4½ p.ct. on Feb. 7. The Banks' deposit rate is 3½ p.ct., and the deposit rates of the Discount Houses are 3½ p.ct. at call and 3¾ p.ct. at notice.

POTENTIAL INVESTMENTS.

XX.—Uxbridge, Maidenhead, Wycombe, and District Gas Company.

The Company was established as the Uxbridge and Hillingdon Gas Consumers' Company in the year 1854, and was incorporated by Special Act in 1861. The name of the Company was changed to the Uxbridge Gas Company in 1906; to the Uxbridge, Wycombe, and District Gas Company in 1920; and to its present name in 1924. The Head Office is at 162, High Street, Uxbridge, Middlesex. The statutory area of supply covers 245 square miles, and includes numerous towns and villages. The Company has absorbed the West Suburban, Colnbrook, Beaconsfield, Amersham, Eton, Great Marlow, High Wycombe, and Maidenhead Companies.

The capital of the Company, as shown by the last published accounts, is as follows:

CAPITAL STOCK.

	£
Consolidated stock	289,094
5 p.ct. preference stock	88,330
5½ " " "	15,000
	£392,424
Premiums	3,499
Remaining to be issued	35,056
Total amount authorized	£430,979

LOAN CAPITAL.

	£
Debenture mortgage	19,900
4 p.ct. perpetual debenture stock	64,325
4½ " " " "	30,000
5 " " " "	50,000
	£164,225
Discount on sale	16,039
	£148,186
Remaining to be borrowed	67,303
Total amount authorized	£215,489

Transfer arrangements: Common form. Registration fees: Transfers 2s. 6d.; any other document 5s. Separate deed for each class of security. Stock is transferable in multiples of £1 (ordinary and preference) and £5 (debenture). Husband may witness wife's signature and *vice versa*. Voting: 1 vote per £10 ordinary stock. No voting rights to holders of preference stock.

Accounts and dividends: Accounts are made up to Dec. 31 of each year and submitted in February, dividend (ordinary and preference) being paid on Sept. 1 and March 1. The standard price of gas is 1s. 3½d. per therm. Present price of gas 12d. per therm. Declared calorific value 470 B.Th.U. per c.ft. Dividends on the ordinary stock are subject to sliding scale—viz., ½d. per therm above or below the standard price = ⅛ p.ct. p.a. in dividend calculated on a quarterly basis.

The following table shows the position of the Company during the past four years:

Year.	Gas Sold.	Capital Employed. *	Per Therm Sold.	Gross Profit.	Total Charge for Capital. †	Rate of Dividend P.Ct. per Annum. Ordinary Stock.	Amount Carried Forward and Balance Reserve Fund.
	Therms.	£	s. d.	£	£	£ s. d.	£
1925	2,967,030	439,434	2 11·6	28,619	28,629	6 12 6	16,321
1926	3,296,312	453,225	2 9·0	26,738	29,051	6 10 0	14,247
1927	3,456,112	473,570	2 8·9	32,465	30,726	6 11 3	16,225
1928	3,625,697	497,696	2 8·9	32,855	32,654	6 18 9	16,666

* Excluding amount added on conversion.
† Includes dividends and interest.

It will be seen that the gas sales show a steady progression. The Directors have adopted the safe policy of conserving their capital, and whereas in the past four years the sales have increased by over 22 p.ct., the capital employed has increased by only 13 p.ct.

The capital employed represents about 2s. 9d. per therm sold, which, having regard to the scattered area of supply and the consequent heavy expenditure on mains, is not excessive.

The following table shows the highest and lowest prices of the ordinary stock, the dividend paid, and the yield p.ct. per annum calculated on the average price:

Year.	Transactions. Highest.	Transactions. Lowest.	Dividend P.Ct. per Annum.	Yield P.Ct. per Annum on the Average Price.
			£ s. d.	£ s. d.
1925	106	94⅛	6 12 6	6 12 2
1926	94¾	84	6 10 0	7 5 5
1927	91	84½	6 11 3	7 9 7
1928	96½	89	6 18 9	7 9 7

The present market quotation is 93-98, yielding at the average price on last year's dividend £7 5s. 4d. p.ct., so that the stock is very attractive.

COAL FOR GAS-MAKING.

Views of Sir David Milne-Watson.

The Coal Trade Luncheon Club held their second luncheon at the Hotel Metropole, London, on Monday, July 8—Lord GAINFORD (President of the Club) in the Chair.

Sir DAVID MILNE-WATSON, D.L., LL.D., Governor of the Gas Light and Coke Company, said that he did not propose to take up much time on the vexed question of high and low temperature carbonization. As they were all probably aware, the gas industry had carried on its operations by high-temperature methods hitherto; and these at the present time seemed to hold the field. Of course, a great deal was heard about low-temperature carbonization and the prospects that it held before the country, but this was a matter which required a great deal more attention than had yet been given to it. His own Company, the Gas Light and Coke Company, at the request of the Government, had installed a very important piece of plant at their Richmond Works, and the whole of that works would shortly be devoted to the production of gas by low-temperature methods. It was rather early yet to say what the results would be, but it was obvious that the Gas Light and Coke Company was not going to make a fortune out of Richmond, and results would require critical examination before coming to any definite conclusion as to the process. The whole question of the success of low-temperature carbonization really lay in the value of the oils produced; and this was a matter upon which nobody at the present moment was able to express a definite opinion. At any rate, it was all to the good that the gas industry was taking part in this investigation. The gas industry was absolutely open minded on this question of low-temperature carbonization. It must be realized that we were not in business for amusement or for health. We were in business to make money; and therefore all processes—low temperature or high temperature—had to stand that test in the end.

Coming to the relations between the gas industry and the coal industry, Sir David said that it was no use sending a sample of coal to a gas undertaking which was not a real sample of the coal intended to be supplied. It was even more important than it used to be, because nowadays, with so many amalgamations among collieries, there were a number of seams being worked, all of which had different characteristics, and it was not sufficient to sell a coal under a colliery name. The coal supplied must come from the particular seam which the gas company knew about. To-day the gas industry was endeavouring to make the most of any coal that it bought. He had often said that, if he were the head of a small company, and could confine himself to one coal, he believed he could get better results than he could as the head of a large company like the Gas Light and Coke Company, which had to purchase something like 2½ million tons of coal per annum, and there was no one source of supply for such an enormous quantity of coal as that. Therefore they had to get coal from various sources, and it was much more difficult to make a study of many coals than if one were confined to one particular coal. Owing to the general high level of prices nowadays, the question of blending coals had come prominently before the gas industry; and it was undoubtedly the fact that extraordinarily good results could be obtained by scientific blending of coals. In that way it was possible to use many coals which would otherwise be unusable so far as the gas industry was concerned. Therefore he again came back to the importance to the coal industry of supplying the gas industry with exactly what was being paid for, and seeing that coal ordered from a particular seam came from that seam.

Another point of great importance was that the coal should be freshly wrought. The gas industry did not want coal from old stock which had been lying about the collieries for a long time. It had been noticed at the various works that great deterioration took place when the coal had been stacked a long time, and, at meetings of the engineers of his Company, one of

the most frequent reasons given for a falling-off in the yield of gas was that the coal came from an old stock of coal. Therefore he asked the coal industry to bear in mind that the coal supplied to the gas industry should be freshly wrought.

Passing to the question of clean coal, Sir David Milne-Watson said this had always been a matter for discussion between the gas industry and the coal seller. Before the war the amount of ash in coal, generally speaking, was about 6 p.ct. By the end of the war it had gone up to at least 10 p.ct.—a very serious matter indeed—but he was glad to say that it had recently been coming down, and now was about 8 p.ct. These figures were merely a general indication; but even 8 p.ct. was very serious to the industry. It also affected the coke, and the trouble went right through from the time when it left the colliery till finally it was burned in some form by the consumer. Therefore there was no message of such importance that he could give to the coal industry as to take every possible means to clean the coal thoroughly.

It might be said, Why does not the gas industry clean the coal? That could be done, but it was at the wrong end of the stick. There was the space taken up in the trucks by 8 p.ct. of ash to be considered, and there was the wagon space taken up afterwards in disposing of the extra amount of rubbish. There was the reduction of effective capacity of the carbonizing plant. There was also the money bill involved in 8 p.ct. of ash in 18 million tons of coal, quite apart from the transport of the ash in the original coal or the disposal of the rubbish after carbonization. Coal containing 4 p.ct. of ash would mean a saving to the gas industry of one to one-and-a-half millions sterling annually. As regards clean coal, there were, of course, several methods, but it seemed to him that attention ought particularly to be given to dry cleaning, because with this there was no difficulty afterwards with the slurry, as in the case of wet cleaning. Nor was there subsequent trouble through excessive moisture in the coal as sent out. Of course, there were wet cleaning processes which were satisfactory, but there was always the difficulty of the slurry and possible excessive moisture in the coal, especially in a wet winter.

INSTITUTION OF GAS ENGINEERS' EXAMINATIONS, 1929.

Completed List of Successful External Candidates.

[The first list was published in our issue for July 10, p 84.]

GAS ENGINEERING.

HIGHER GRADE.

Name.	Class.	Ancillary Subjects.
Petersen, Charles Fuller	1st	Maths., Engineering Science, Strength of Materials.
Duncan, Thomas Moncur	2nd	Maths., Inorganic Chemistry, Organic Chemistry, Physics.
Lowe, Frank	2nd	Maths., Physics, Chemistry.
McCaskill, Douglas Napier	2nd	Machine Drawing, Mechanics, Heat Engines.
Nichols, James Allen	2nd	Mechanics, Heat Engines, Theory of Structures.
Pye, James William	2nd	Maths., Mechanics, Machine Drawing, Heat Engines.
Risby, Harry James	2nd	Engineering Science, Organic Chemistry, Chemistry of Gas Manufacture.
Ross, Louis Alfred	2nd	Maths., Machine Drawing and Design, Heat Engines.
Sharman, Ernest William	2nd	Chemistry of Gas Manufacture, Engineering Science.
Staniforth, Claude Bertram	2nd	Inorganic Chemistry, Organic Chemistry, Machine Construction and Drawing.

ORDINARY GRADE.

Name.	Class.	Ancillary Subjects.
Fawkes, Stanley Victor	1st	Mechanics and Heat Engines, Building Construction, Inorganic Chemistry.

[The results of the internal examinations will be published in due course.]

THE MINING SITUATION.

The July-September issue of "The Financial Review of Reviews" contains an interesting survey of the mining situation in Great Britain by John B. C. Kershaw, F.S.S., in which he sets out to examine its present position and future prospects. It is really a most unfortunate state of affairs, though one which nowadays is accepted almost as natural, that any discussion on the coal trade inevitably takes a political turn. It is principally in the light of the present political situation that Mr. Kershaw sets about his deductions, one of the chief of which is that the new Government "will be unable at present to do very much harm to the trade and industry of the country, except with the support of and by agreement with the Liberal Party." It is, of course, a matter of opinion as to what constitutes harm, and which of the measures that might receive Liberal support would come under that category. But the writer is more sanguine than many observers in assuming that "the coal mining industry may look forward to a period of peaceful development along the lines upon which it is at present travelling, undisturbed by any rash experiments in Socialistic schemes." Present indications are that the mining section of the community are most decidedly not going to let the Government forget that they expect something in return for their powerful support, and on the hours question in particular and the whole future in general there is already that uncertainty overhanging the industry which is at all times such a hindrance to trade.

Interesting figures are quoted showing the position before and after the long stoppage of 1926, and how, with the increased hours, the output per man shift increased from 18 to 21·29 cwt., with a reduction in working costs of as much as 3s. a ton in some cases. Even so, it is only in the first quarter of the current year that the mines of this country have been able to recover enough trade to make ends barely meet. There will be a large measure of agreement with the writer that such figures should be a potent argument in favour of giving the industry a further run, low as the miners' wages may be. At the same time, once an industry has the misfortune to attract the interest of political parties, its economics are liable to become a secondary consideration. One of the most significant facts quoted, and one which serves to emphasize the difficulties of the whole situation, is that in 1926, when British production was 120 million tons below normal, the world output was down by only 2,300,000 tons. With such a potential world over-production, the recent recovery in British coal exports is all the more remarkable.

Turning to the possibility of improvements in organization, the writer of the article considers that the present year is likely to witness a considerable extension of the movement towards unified control in well-defined mining areas. It is generally agreed by impartial observers that there exists considerable scope for amalgamations of small units in the industry, which at present appear in so many cases to be selling exactly the same class of coal against one another in the export markets. It is the opinion of many that by such amalgamations far more could be done to improve the position than by artificial restriction of output and selling schemes. Many of the smaller and older mines cannot now normally be worked to yield any profit, and the writer expresses his opinion that "some arrangement ought to be made in each area whereby these smaller mines can be taken over by the more prosperous ones, and closed down, if only temporarily, in order that production may be concentrated at the larger and better equipped mines." Unfortunately this criticism is not very helpful. Prosperous is only a comparative term in this case, and there are few mining concerns in the country now which can even contemplate adding to their liabilities, so that finance is the barrier in most of these cases, as also to many amalgamations of the comparatively "more prosperous" concerns one with another.

The present states of development of underground mechanization and of washing and grading of coal came in for their share of criticism. Generalization in these directions is unconvincing, though the figures quoted are certainly interesting. For instance, 85 p.ct. of the Ruhr output is mechanically won, against 55 p.ct. in Scotland, and only 22 p.ct. for the whole of Great Britain. The writer is strong in his condemnation of extravagant hopes which some people have seen fit to raise in boosting low-temperature carbonization processes. There is no need in this note to enlarge upon this theme, or to point out that such processes quite definitely do not offer prompt and entire salvation to the mining industry.

In conclusion, the writer examines the present position as to the recommendations of the Samuel Report of 1925, and he finds that the majority are already actually being put into effect. If the present Government tackles those that are not, it is his opinion that "none of them is likely to interfere seriously with the recovery of the prosperity of the industry which is now in sight, and legislation on these lines may be regarded by the owners with equanimity."

NEW SHOWROOMS AT WOLVERHAMPTON.

Formal Opening by the Mayor.

An important scheme of extensions and alterations, including the provision of up-to-date showrooms, has just been carried out by the Wolverhampton Gas Company at their Head Offices in Darlington Street, Wolverhampton; the showrooms being formally opened on July 10 by the Mayor of Wolverhampton, Alderman A. E. Wood.

The great expansion of business in recent years, and the necessity of bringing their showrooms up-to-date to display to a discriminating public the latest appliances for lighting, heating, and cooking, compelled consideration of the scheme for the remodelling of the premises. The result, which has won the warm approval of friends and competitors, is the provision of tastefully appointed showrooms, more in keeping with the demands of the times, superseding the cramped premises which have served for the last 48 years, and an extension of accommodation for the staff and for store purposes which cannot but add to the efficiency of what is regarded as a sound, go-ahead undertaking.

The first step was to approach the British Commercial Gas Association, who were asked to submit a report and scheme, and Mr. H. Marcus Brown, L.R.I.B.A., of Wolverhampton, was then asked to prepare the necessary plans and designs to give effect to the scheme.

In order to interfere as little as possible with the business, the work was divided into sections. The contract for building was entrusted to Messrs. Wilson Lovatt & Sons, Ltd., of Wolverhampton; and the shopfitting to the firm of Harris & Sheldon, Ltd., of Birmingham.

The new premises comprise a large basement for stores. On the ground floor are a yard, shops for cleaning and repairing stoves, fitting stores, &c.; a number of dome roof lights giving adequate natural lighting. On the first floor, extending over a considerable portion of the premises, are offices for clerks and inspectors, fitters' workshop, meter and lamp repair shops, and testing room. The buildings are constructed of brick and reinforced concrete, and an electric lift connecting the floors has been installed by R. A. Evans, Ltd., of Leicester. The buildings are connected with the existing premises by a covered bridge and corridors.

The old showrooms have been entirely remodelled. All the interior walls have been taken out, and adjoining offices included to form a large showroom. This is panelled throughout in oak. The floor is of oak blocks, and a handsome oak staircase leads to the Board room and secretarial department on the first floor. The entrance to the showrooms and cash counter in Darlington Street forms the main feature in the frontage. A bold bronze pediment is supported by granite columns with Ionic caps in stone, presenting a rich and imposing appearance. The windows have bronze metal frames, with frieze and pilasters of Aberdeen granite, and the whole frontage has a very pleasing effect.

The heating throughout is by the low-pressure hot water system, carried out by Messrs. Manley & Regulus, of Wolverhampton. The scheme has necessarily caused a general remodelling of the administrative quarters on the first floor. The stores and workshops have been transferred to the new building in the rear, which covers an area of about 5000 sq. ft.; and more adequate accommodation has been provided for the clerical staff. The scheme should meet the needs of the Company for many years to come.

A visitor entering the new showrooms from Darlington Street—one of the main thoroughfares of the town—cannot but be impressed by the excellence of the design. The public have to pass through the handsomely appointed showrooms to reach the cashier's circular counter. This gives the consumers an opportunity of seeing at a glance the full range of modern gas appliances, tastefully arranged.

The windows are lighted by special lamps (designed by Mr. Alfred Coombes, the Fittings Superintendent) concealed behind parabolic reflectors. The showrooms are fitted with a number of handsome 5-light chandeliers with distant control, these fittings being supplied by Messrs. Evered & Co., of Smethwick. The stores are fitted with metal adjustable store bins of the Sankey-Sheldon type, the lighting of these premises being by "Surbiton" lamps.

There was a large gathering at the opening ceremony—Mr. A. B. HANBURY-SPARROW, J.P., the Chairman of the Company, presiding.

The CHAIRMAN, in welcoming those present, briefly traced the history of the Company since its foundation in 1820. Their first works were in Horseley Fields, the Engineer being Mr. John Grafton. In 1847, they absorbed by Act of Parliament the Wolverhampton New Gas Company (formerly the Wolverhampton, Dudley, and Bilston Gas Light and Coke Company), and in the following year a site of 5¼ acres was acquired on the Stafford Road, where the present works were built. These were enlarged from time to time as the concern grew, until, in 1897, the construction of a complete new section was begun on a site of 9¼ acres on the other side of the canal, in the parish of Bushbury, now part of Wolverhampton. In 1920, the capacity of the works was further enlarged by the erection of the first section of an installation of vertical retorts, and a second and third installation followed in 1925 and 1928. The Company had a further 15 acres of land which was available for future extensions, part being at present used as a sports ground for employees.

At first, the offices were in Horseley Fields, but later central offices were opened in Queen Street, and, in 1880, offices and showrooms in Darlington Street were erected. With the continued progress of the undertaking, however, and the ever-increasing popularity of gas as an economical and clean service for cooking, heating, lighting, and innumerable industrial purposes, the premises became totally inadequate, and, in consequence, the Directors deemed it essential to re-model the premises, and erect new stores and workshops, on the site in Clarence Street acquired in 1908. They were proud to think that the new premises would be not only a credit to the Company, but an asset to the town. The work certainly reflected every credit on the architect and the contractors.

The Company, he went on, had always striven to give the best of

service to their consumers at the lowest possible price consistent with the reasonable interests of the shareholders; and it was the keen desire of the Directors and staff that this should continue. Gas was a valuable aid to the purity of the atmosphere and a vital factor in promoting the health of the community. They, of course, had their competitors, especially electricity, but so long as it was fair they did not mind competition. They rather liked it, as it put them on their mettle. Their policy was to be on good terms with their competitors, and he saw no reason why gas and electricity should not run together in harness as faithful servants of the great public. He mentioned, in passing, the interesting fact that in 1862 Messrs. Glaisher and Coxwell filled at the Wolverhampton Gas-Works the balloon in which they made their famous ascent, attaining a height of seven miles.

It was a matter of deepest regret to the Board that their late Engineer and Manager, Mr. P. G. Winstanley, who was their Chief Officer from 1898 to 1929, and always had the interests of the Company keenly at heart, did not live to see the completion of the works inaugurated under his régime. He would also like to say how much the Board were indebted to the Heads of departments and to the staff generally.

Mr. Hanbury-Sparrow then gave some interesting comparisons showing the growth of the Company since he first joined the Board 25 years ago. In 1904, the output of gas per annum was 571 million c.ft.; to-day it was 1210 millions. In the same period the total number of consumers had increased from 11,052 to 34,416; slot consumers, included in that figure, from 4494 to 25,060; slot cookers from 2557 to 23,290; ordinary cookers on hire purchase from 2050 to 8807; while the total length of mains had risen from 95¾ miles to 149½ miles. The number of shareholders, including debenture stockholders, had risen from 565 to 1276. When the Company was formed the price charged for gas was 15s. per 1000 c.ft.; to-day it was 3s. 5d., equivalent to 9·11d. per therm. The original capital of the Company was £10,000; to-day it stood at upwards of £426,000, including debenture stock.

The MAYOR, in declaring the new showrooms open, said he was

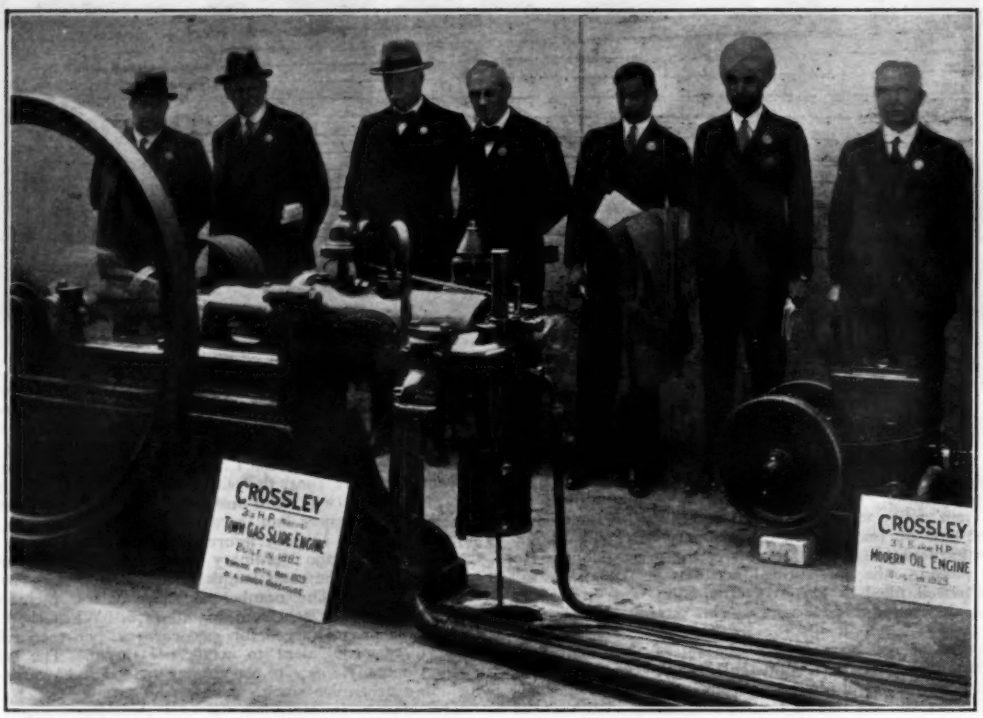
delighted to be associated with such a prosperous and progressive Company. In the face of tremendous competition, gas had kept its position well in the front. Its uses were constantly being extended in various ways, and he thought the Company richly deserved their success for their business enterprise. Those handsome showrooms spoke for themselves, and he offered his warmest congratulations on the completion of the scheme. He was glad to note the Chairman's reference to public health; they all realized that the elimination of smoke was highly conducive to the health of the community. As a Corporation they were proud of their main shopping thoroughfares, and that notable addition to one of the most important streets of the town was one which other business firms might well follow. He wished the Company every success in the future.

Mr. J. W. TILLEY (a Director) proposed, and Mr. S. LOVERIDGE (also a Director) seconded, a cordial vote of thanks to the Mayor, who was presented by the Chairman with a silver cigarette box as a memento of the occasion.

The Chairman was thanked on the proposition of Mr. L. B. MORETON, seconded by Mr. H. LEE, and subsequently those present were entertained at tea and conducted over the new premises.

GAS AND OIL ENGINES IN THE MAKING.

Record of Sixty-Three Years' Progress.



Behind the engine, reading from left to right, are Sir Wm. A. Tritton, of Messrs. Fosters, Ltd., Lincoln; Mr. G. R. Sharpley, of Messrs. Ruston & Hornsby, Ltd., Lincoln; Mr. P. W. Petter, of Messrs. Petters, Ltd., Yeovil; and Mr. J. J. Carter, Managing Director of Messrs. Crossley Brothers, Ltd.

On June 27, the Institution of Mechanical Engineers visited the Openshaw and the Erwood Park Works of Messrs. Crossley Brothers, Ltd. The accompanying photograph shows some of the visitors inspecting an old-type engine. This, a 3½-H.P. nominal slide gas engine, built in the year 1882, worked until May last in continuous service for 47 years. It still operates perfectly satisfactorily, but is no longer an economical unit. By its side will be observed a small 3½-H.P. Crossley oil engine, to illustrate the advance made in modern design as regards simplicity and compactness.

It affords an interesting study to the mechanical engineer to trace the various stages of development made with design and construction of the internal combustion engine. The present-day motor car and aero engine are, in fact, the outcome of experience first gained upon the early gas engine.

The firm of Crossley Brothers, Ltd., was originally founded in 1866 by the brothers, Francis William, and William John, Crossley, trading as Crossley Brothers. They were the pioneers in Great Britain of the internal combustion engine, when the original Otto & Langen gas engine was developed and built at Manchester. That was in the year 1869. It was some years later when the Crossley oil engine with lamp heated vaporizer, and using paraffin fuel, was developed and manufactured. In 1881, the firm was incorporated as a Private Limited Company, and in 1897, on the death of the senior partner, Mr. F. W. Crossley, the business became a Public Limited Liability Company under the Chairmanship of the late Sir William J. Crossley, Bart. Shortly before his death in 1911, his eldest son, afterwards Sir Kenneth I. Crossley, Bart., J.P., accepted the position of Chairman of the Company, which he still holds.

Early development in 1869 took the form of the atmospheric gas engine—a vertical construction with the cylinder below and the crankshaft above; and engines were successfully built to develop quarter, half, one, and two nominal horse-power on town gas. The next stage saw the horizontal engine with compression before ignition, which became the accepted principle on which all future internal combustion engines operated. A slide valve controlled the admission of the mixture of gas and air to the cylinder. Flame ignition was employed. At a later stage, poppet valves were introduced for the gas and air admission, while other improvements quickly followed, including tube ignition, and, later, electric ignition. More than 100,000 Crossley oil and gas engines have been built; and to-day there are examples of gas engines still at work, or being used as stand-by, after a period of fifty years.

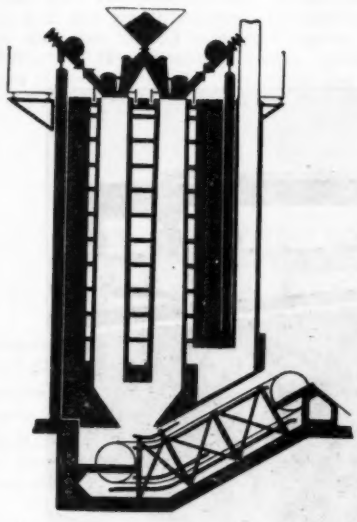
OPENSHAW WORKS.

The head works at Openshaw are now utilized solely for the building of horizontal and vertical type engines of powers ranging from 20 to 330 B.H.P. Other sizes and types are built respectively at the Erwood Park, Sandiacre, and Bedford factories. The Openshaw Works include large foundries, machine, erecting, and testing shops, and laboratories. Castings are made up to 30 tons weight, and the output in castings alone averages 150 tons per week. All parts are produced in quantity to jig and template, to ensure absolute accuracy of production. Horizontal and vertical engines are constructed as single, twin, and multi-cylinder types for industrial and electric lighting purposes. Every engine built is thoroughly tested on the brake before despatch, to comply with the conditions of the British Engineering Standards Association.

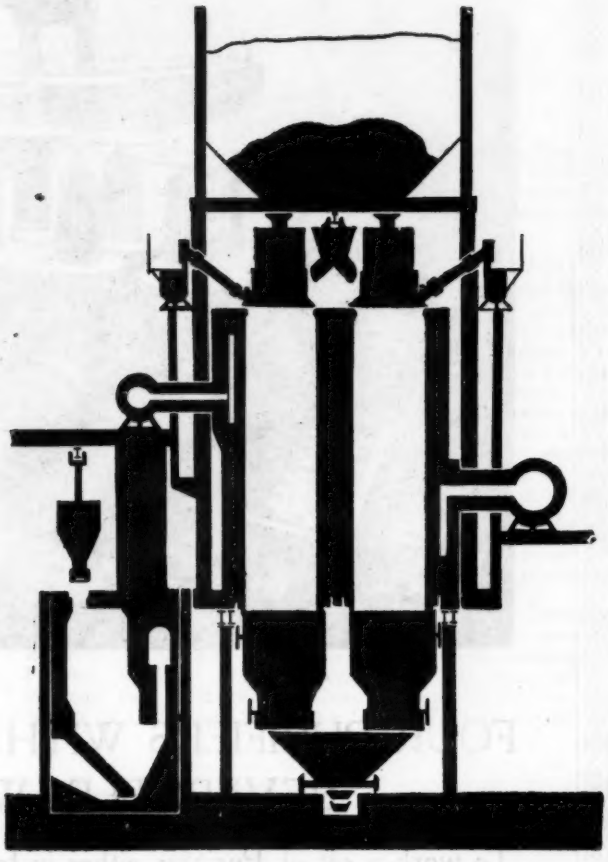
Shortly before the war, the crude oil engine having pump injection of the fuel oil after compression was developed, and this became the forerunner of the present type of cold starting airless injection heavy-oil engine. Recent development upon

W-D

WOODALL-DUCKHAM CONTINUOUS VERTICAL RETORTS



FIRST 1903



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Plants of this Type have been built with a Carbonising Capacity of TEN MILLION TONS PER ANNUM

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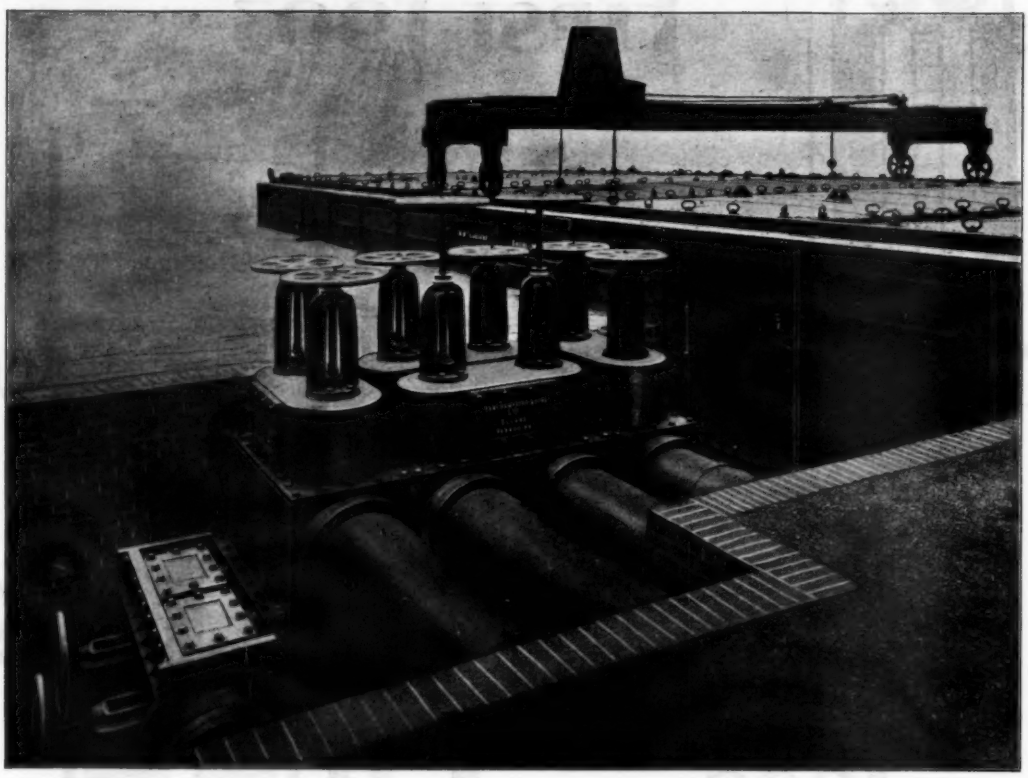
PURIFIERS.



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To work a set of Purifiers either in forward or backward rotation at will. The flow through the whole of four Purifiers can be changed by operating only four hand wheels.

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oil engines of medium power has been in the direction of the totally enclosed type, which was seen under construction at Openshaw, both horizontal and vertical, with single and multi-cylinders. The Crossley vertical compressorless Diesel engine was also seen in process of construction and on test. This new engine is built upon the unit principle, having cylinders from 1 to 6, and in powers ranging from 27 to 300 B.H.P. working load. These totally enclosed engines have all the moving parts fully protected and working under forced lubrication. The vertical engine is especially suitable for direct coupling to A.C. or D.C. generators to operate in parallel, or for driving air compressors.

ERWOOD PARK WORKS.

In 1915, in order to deal with war work, additional land was acquired at Erwood Park, Heaton Chapel, near Stockport, and new works were built. These works now deal exclusively with the manufacture of suction and pressure gas plants, and also small engines. In addition to being pioneers of the gas and the oil engine, Crossley Brothers were the originators of the system of power production through the medium of the suction gas plant about the year 1903. Originally the plants were only suitable for gasifying mineral fuels and charcoal, but in 1908 the firm turned their attention to the generation of producer gas from wood and vegetable refuse fuels. A great deal of experimental work was carried out in this direction, and in the year 1909 the first commercial unit was installed and set to work at a sawmill in the Manchester district. This plant was replaced by one of more modern design in 1928. Since 1909, hundreds of installations, ranging from 10 B.H.P. to 3000 B.H.P., using almost every kind of carbonaceous vegetable refuse, have been supplied to all parts of the world.

At the Erwood Park Works specially equipped shops are set apart for quantity production of small horizontal petrol and paraffin engines ranging from 4 to 17 B.H.P., and for vertical 2-stroke oil engines using fuel oil, from 6 to 23 B.H.P., arranged with separate scavenge pump.

In 1919, the Premier Gas Engine Company's Works at Sandiacre, near Nottingham, were acquired, where the building of large gas engines has continued, both horizontal and vertical types up to 1000 B.H.P. capacity. In addition, the Crossley-Premier heavy-oil engine of the multi-cylinder type has been developed. During the past two years a special development of the *vis-a-vis* or opposed type of oil engine has taken place. This engine is especially suitable for large powers.

GAS AT THE ROYAL AGRICULTURAL SHOW, HARROGATE.

Attractive Displays.

Gas and gas appliances played a big part in the Royal Agricultural Show, at Harrogate, from July 9 to 13, alike as to an impressive exhibit on behalf of the industry and in practical service to caterers and others.

The Harrogate Gas Company laid nearly two miles of special mains and pipes on the 80 acres showground on the Stray. The supply services ranged from 4 in. down to ¾ in. in diameter, supplying the various kitchens, cafés, and a number of exhibitors' stands in addition to that of the Gas Company. The Gas Company supplied and fixed no fewer than 113 cooking appliances, including cookers, hotplates, hot closets, boilers, &c.; and they connected up about fifty appliances brought by other exhibitors.

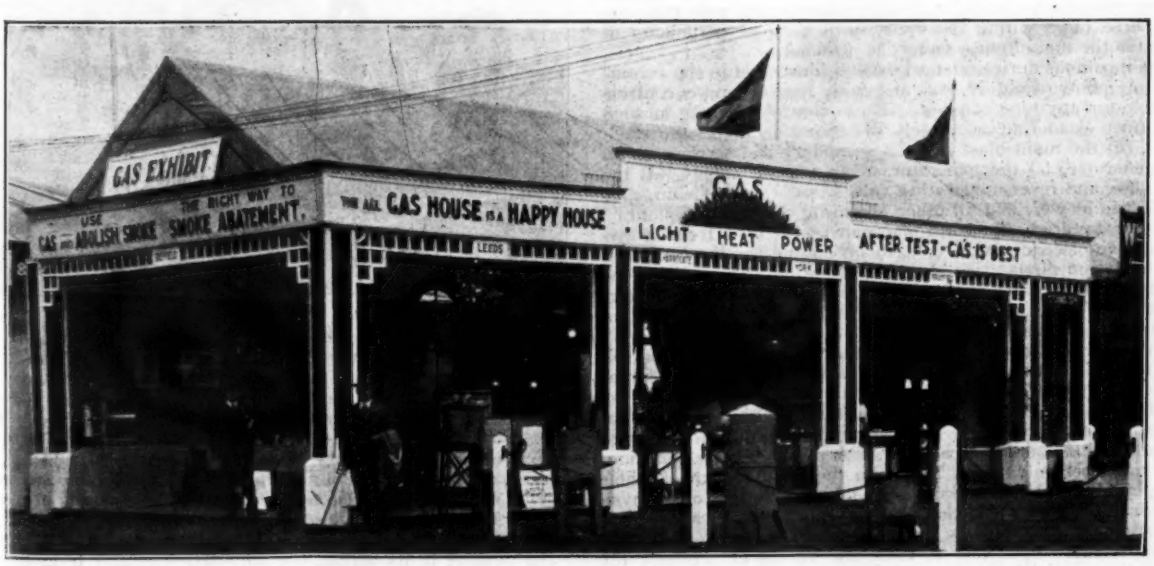
Through the kind offices of Richmonds Gas Stove Company, the Harrogate Gas Company were assisted in the supplying of cooking apparatus by the Manchester Corporation Gas Department. Along with the Corporation gas undertakings of Leeds and Bradford, and the Sheffield and York Gas Companies, the Harrogate Gas Company had a very fine stand, in the implement section, showing a comprehensive display of gas appliances for the farm and the home. The British Commercial Gas Association co-operated by the loan of a "Smoke Abatement" and "Bye-Products" exhibit, which, as is always the case with "B.C.G.A." display efforts, attracted a great deal of attention and interest.

The special gas industry stand was in a particularly good situation in the showground, at the end of a row, between the implements section and the great flower show, with ample frontage, and arresting signs. Mr. F. H. Robinson, Engineer and Manager to the Harrogate Gas Company, his Directors, and other collaborators, are certainly to be congratulated on having presented a display which attracted as extensive and diversified an interest as any in the great show.

EXHIBIT OF MESSRS. DAVEY, PAXMAN, & CO., LTD.

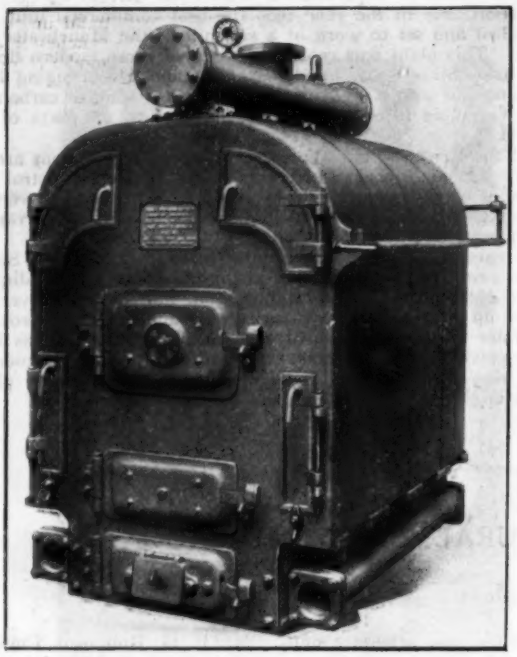
Messrs. Davey, Paxman, & Co., Ltd., Engineers and Boilermakers, of Colchester, exhibited a 120-138-B.H.P. 3-cylinder vertical heavy fuel oil engine, which is representative of this firm's wide range of oil power plants. These engines start instantly from cold, and are built on the well-known Paxman principle of unit cylinders and ventilated crank cases. The injection of the fuel is on the "spring injection" system made under licence from the patentees (Messrs. Blackstone & Co., Ltd.), and the design embodies the Paxman patent eccentric operated exhaust valve gear. A noticeable feature of these engines is the extreme evenness of the distribution of the fuel to all cylinders, which serves to demonstrate the benefits to be obtained by having independent fuel pumps to each cylinder, particularly since these fuel pumps and their pipelines are free from pressure, which is the case with the "spring injection" system.

Other separate parts of the engine were exhibited, including a sectional head completely fitted with valves, and camshaft which can be operated by hand to demonstrate its working. A Paxman 8-cylinder engine of 1070 B.H.P. has been running for some time at the Ashford Central Electricity Station; and due to its satisfactory working a further Paxman engine, de-


GAS EXHIBIT
USE GAS AND ABOLISH SMOKE
THE RIGHT WAY TO SMOKE ABATEMENT
THE ALL GAS HOUSE IS A HAPPY HOUSE
LEEDS
GAS
LIGHT HEAT POWER
AFTER TEST - GAS IS BEST

HARROGATE GAS COMPANY'S STAND AT THE ROYAL SHOW.

veloping 1500 B.H.P., is being supplied, and a similar engine is on order for the Basingstoke Corporation. Both these engines



Paxman Patent All-Steel Sectional Boiler.

will be fitted with superchargers, and will be the largest airless injection engines yet built in this country for land station work.

A model of the renowned Paxman "Economic" type boiler was also on view. This boiler, on account of its large effective heating surface, has, we were informed, an efficiency equal to that of the ordinary Lancashire boiler nearly double the length and fitted with an economizer.

A Paxman patent all-steel sectional hot water boiler was also shown. Due to the nature of the material used in the manufacture of these boilers, the risk of fracture is avoided and the life of the boiler materially increased. They are built up on the multiple-unit system; the size of the unit being determined by the number of sections used. They are made in three types—namely, for central heating by means of hot water; central heating by means of low-pressure steam; and for domestic hot water supply.

A Locomotive that Thinks for Itself.

Visitors to the Show had the opportunity of inspecting a new type of internal combustion locomotive. This engine was running on the stand of Messrs. Kerr Stuart & Co. It is fitted with a Diesel engine burning crude oil at less than 4d. a gallon; and it is the first locomotive in the world to make use of the new Robertson infinitely automatic variable gear. What this latter means is fairly well summed up in the makers' claim that it is "a locomotive that thinks for itself." The gear fitted to this locomotive changes itself up and down in accordance with the load put upon the locomotive; the work of the driver being reduced to that of handling the engine throttle and the brake. The gear, though doing a complex job, carries it out in a simple manner. It has a minimum number of working parts, and for over 90 p.ct. of its life all these parts are locked solid, and do not move. We were informed that experience with this gear, previous to its being adopted for the Kerr Stuart locomotive, shows that after a hundred thousand miles of hard work there is scarcely sufficient wear on the friction surfaces to be measurable. These, the only wearing parts in the gear, can be replaced at an expenditure of a few shillings and in less than half-an-hour. In addition to its transmission, the Kerr Stuart Diesel locomotive is characterized by having a prime mover that is extremely economical. It uses, actually, rather less than $\frac{1}{2}$ lb. of fuel oil per B.H.P.-hour.

MECHANICAL OPERATOR IN TOTAL GASIFICATION PLANT.

Important Development.

Important developments have been perfected recently in the Tully total gasification plant, the effects of which are likely to prove of far-reaching influence in this country and in other parts of the world.

Mr. C. B. Tully has devised for his well-known plant a controller, the object of which is to operate on short cycles with positive accuracy. The result, so it is stated, is the production of a uniform quality of gas. Less material and labour are required than with the ordinary controlling and hand-operated valves. The wear on the apparatus is reduced; the quantity of clinker in the generator is lessened; and the capacity of the gasification set is increased.

The timing mechanism consists of only one timing shaft. It revolves in one direction, and is so arranged that the time of opening and closing of any operating valve can be varied positively. After the timing mechanism has been accurately set to suit local requirements, the time of the cycle can be altered during the period of running without interfering with the relative percentages within the cycle, until the best periodicity of cycle for the maximum economy is attained.

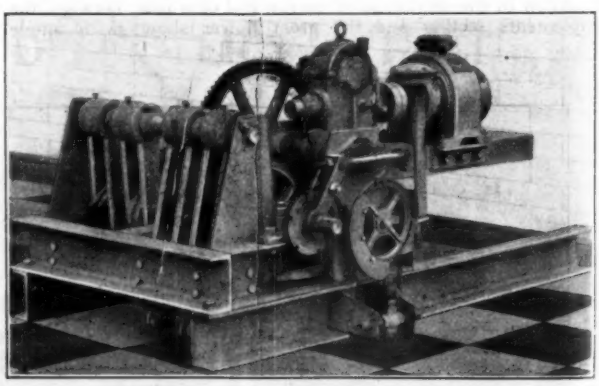
The ingenious device referred to, and illustrated in the accompanying photograph, is designed with four or more controls suitable for any type of plant. These controls operate in such a manner as to time accurately the operation of (*a*) the stack valve, (*b*) the main blast and the secondary and tertiary air to the generator, (*c*) the generator steam and oil supply, (*d*) the wash-box and reverse operating valves, and (*e*) the steam, gas, or electric blower, and all other operating parts of the plant.

Power to drive the controller can be derived from a gas engine, an electric motor, or a steam engine; or the controller can be driven direct from the blower engine. If required, the plant can be operated by hand by quickly throwing the motor-shaft out of gear by means of a clutch, so putting out of action the mechanical device.

An important advantage of the mechanical form of control, automatic in action, is that each change is made to occur at exactly the moment desired. The time of the cycle can be shortened so that a lower maximum and a higher minimum temperature are obtained, thus resulting in uniform quality of output, and almost producing the effect of continuous operation.

It must be remembered that with the hand system of water gas plant control the workman has to exert the personal physical effort of opening and closing a number of heavy valves every few seconds, using a clock as his guide. He cannot, therefore, be expected to open and to close the valves at precisely the moment essential for exact, and therefore economic, operation. The maximum operating efficiency is only to be attained by the valves opening and closing at the correct moment.

Compared with the old hand method, by the use of the new form of automatic control (which is being successfully applied to all the new installations of Tully plant, and is being fitted to existing plants) the gas produced is more uniform in quality, due to the even operating temperatures, conditions, and time. Less generator fuel is needed, as a short cycle maintains a more constant temperature of the fuel bed for uniform quality of gas production; and a soft character of clinker results. Less carburetting oil is used, owing to the more uniform temperature of the chequer brick-work. A longer life of the re-



fractory materials of which the generator is constructed is achieved, consequent upon working with more uniform temperatures through short cycles of operation. The capacity of the plant is increased, because less time is demanded for the process of clinkering, and less time is needed to work the operating valves. The heats also are more uniform. There is likewise the further great advantage of less labour being required, as the length of clinkering time is considerably reduced.

One man can supervise the operation of several sets of plant. All he has to do is to feed the fuel to the generator, and to glance at the operation of the automatic controller. Mechanically positive in its action, the automatic operator brought out by Mr. Tully renders the plant foolproof and safe in every way.

GAS DEHYDRATION AT PORTSMOUTH.

By S. E. WHITEHEAD, B.Sc., A.M.I.Mech.E.

At the end of last month the writer read some notes on this subject before the Eastern District of the Southern Association of Gas Engineers. In response to a suggestion from several engineers, that these notes should be published, they are here given with the addition of one or two points which arose in the subsequent discussion.

Gas drying is without doubt a process of the utmost importance to the industry, as well as one of considerable interest; and, while it is realized that much has been written on the subject, it is felt that the experience gained during nearly two years' continuous operation at a fairly large works may be of help to gas engineers who are considering the adoption of the process. At the same time it is a difficult subject to treat adequately, for three reasons:

(1) The construction and working of a "Dri-Gas" plant is so extraordinarily simple and free from trouble, and has been described so well and so frequently, that there is little to say on that head.
(2) The difficulties of, and benefits from, dry gas in mains, services, and meters, cannot possibly be assessed with any certainty for some years.
(3) In the particular case of the Portsmouth Gas Company only about 65 p.ct. of the output is dehydrated; and as the works and mains are inter-connected, any definite effects are more difficult to trace.

It is first necessary to get a correct perspective of the theoretical principles involved, and these are briefly as follows:

The corrosion of metals can, in general, only take place in the presence of liquid water. If the humidity of the gas is reduced to such an extent that its dew-point is lower than the minimum temperature to which it is subjected between the gas-works and the consumer's burner, no liquid water will be deposited, and therefore no corrosion can (theoretically, at any rate) occur.

Gas as measured and stored may be saturated with water vapour, and the amount of the latter carried is then approximately as follows:

Temperature ° Fahr. . . .	30	40	50	60	70
P.ct. water vapour by volume	0·55	0·83	1·20	1·73	2·44
Equivalent gallons per million	26	39	56	82	116

If, therefore, we take as an example gas measured at 60° at the station meter, and afterwards reduced to 40° Fahr. in the consumer's service, the object will be achieved by extracting some 50 galls. of water from every million c.ft. sent from the works. The resulting gas will have a dew-point of about 35° Fahr., and it should be noted that, while its volume has been reduced by approximately 1 p.ct., its actual calorific value has increased in the same proportion. The term "actual calorific value" is used because, before being tested in accordance with the Gas Referees' prescription, the gas is again saturated with water vapour.

Several methods of effecting this dehydration have been proposed and described. The two which are actually used in this country are similar in that the gas is washed with a liquid, which at any particular temperature possesses a much lower vapour pressure than that of water in gas at the same temperature. The result of the washing is a transfer of water from the gas to the reagent. This is carried out on counter-current principles, and the solution leaving the washer must be reconcentrated, and thereby restored to its low vapour pressure, by evaporation of the water. A number of substances are available for this purpose, including glycerin and calcium chloride, and a 40 p.ct. solution of the latter is employed at Portsmouth.

It may here be noted that the vapour pressure of the calcium chloride solution increases with rise of temperature. It is therefore of primary importance that the solution entering the washer should be as cool as possible; in other words, the efficacy of the drying plant is dependent to a certain extent upon the temperature of the cooling water. The absorption of water being exothermic, the function of the coolers is to remove the heat added in the washer as well as in the concentrators.

The absorber, whether rotary washer or tower scrubber, must obviously deal with purified gas, and may be placed either before or after the gasholders. If the latter position is favoured, the plant must be capable of passing, without undue back-pressure—the maximum *output* of gas; a vastly different thing from the maximum *make*—but, on the other hand, the necessity for an oil-film on the holder water does not arise. This is of some moment when the appearance of the gasholders is an important consideration. On the whole, it will usually be found more convenient to extract the moisture between the station meters and the gasholders, among the advantages of this position being the following:

(*a*) A smaller plant is suitable for the work.
(*b*) The conditions of gas flow are much more uniform, and the process is therefore more easily regulated and maintained at full efficiency.
(*c*) No additional back-pressure is introduced between gasholders and station-governors—an important point, particularly in the absence of boosters.
(*d*) The gasholders are protected from internal corrosion, not only by the filming oil which adheres to the sheeting, but also by the fact that the gas stored is dry.

A gas drying plant was put into operation at the Hilsea Works in September, 1927. A rotary brush washer of twelve bays had been previously installed at the inlet of the gasholders for naphthalene removal, and one-half of this was taken for a chloride washer; the tanks, pumps, coolers, and concentrators being added. The cooling water is obtained by gravity from an elevated gasholder tank, passing thence into a second holder tank at a lower level, from which a pump returns water to the higher tank.

No plant has yet been installed at the Flathouse Works, so that only about 65 p.ct. of the total make is dried. A third holder station at Rudmore is supplied from both manufacturing works, so that at present a portion of the supply is dried, a portion saturated, and a third part is a mixture of the two—*i.e.*, partially dried. The outlying country districts, however, and a portion of Southsea, are supplied solely with dried gas from Hilsea. Oil films have been provided on both the Hilsea and the Rudmore gasholders.

There is little to report as to the working of the plant, which is very simple and automatic. No serious trouble has been experienced, and working details may best be indicated by the following table, which gives the average conditions throughout the plant during each of the past twelve months.

It will be seen that the strength of the chloride solution drops about 1° Tw. in passing through the washer, and that the flow over the concentrators is only about one-fifteenth of that through the washer.

It may here be noted that the gas entering the chloride washer is very rarely saturated with water vapour. The saturation at Hilsea, for instance, averaged 91 p.ct. during February, and only 81 p.ct. during May of this year.

The operation of the plant has presented few difficulties. A

Monthly Average Readings on "Dri Gas" Plant.

Month.	Gas Treated. Thousands per 24 Hours.	Cooling Water Temp. ° Fahr.	Liquor Entering Washer.		Liquor Leaving Washer.		Liquor in Store Tank.		Liquor Flow. Galls. per Hour.		Average Atmospheric Temp. ° Fahr.	Dew-Points of Gas ° Fahr.		
			Strength ° Twad.	Temp. ° Fahr.	Strength ° Twad.	Temp. ° Fahr.	Strength ° Twad.	Temp. ° Fahr.	Through Washer.	Over Concentrators.		Inlet Chloride Washer.	Inlet Gasholders.	Outlet Gasholders.
1928—														
June . .	4119	52	78	63	76	74	77	74	1556	130	58	63	37	38
July . . .	3870	54	80	69	78	81	79	80	1014	109	68	67	40	41
August . .	4024	58	76	68	74	78	75	78	1548	119	63	67	41	48
September .	4102	61	79	66	78	75	78	74	1530	106	57	61	38	41
October .	4743	59	79	63	77	71	78	71	1373	123	53	57	37	39
November .	5030	56	79	59	78	65	79	65	1318	125	48	51	34	35
December .	5707	51	77	55	76	62	76	63	1545	101	40	45	32	36
1929—														
January .	5851	48	76	51	75	57	76	58	1577	92	35	40	29	34
February .	6226	45	75	45	74	50	74	50	1594	96	33	39	25	31
March . .	5585	45	76	51	75	59	75	59	1479	93	43	50	29	34
April . .	4871	49	77	54	75	64	76	64	1316	71	45	52	31	33
May . . .	4257	52	79	59	78	68	79	68	1379	83	53	56	33	36

slightly weaker solution is used in winter in order to avoid blockage of the 3-in. feed pipe to the washer through solidification of the chloride, and as a further precaution a 3-in. overflow has been fitted from the chloride feed head back to the storage tank. Coolers and concentrators have been shielded from wind by light sheet-iron screens.

During the winter of 1927-28 a 6-in. deposit of mud was found in the chloride storage tank. On investigation this proved to be mainly naphthalene. It was then found that naphthalene to the extent of 3 grains per 100 c.ft. was being deposited in the "Dri-Gas" washer. Most of this naphthalene was vaporized in time on the concentrators, and with a return of warmer weather the trouble disappeared.

Deposits of calcium carbonate have sometimes occurred on the tubes of the concentrators, and these have been traced to the absorption of ammonia from the gas. This deposit is easily removed. Back-pressure in the washer has occasionally caused trouble owing partly to deposits and partly to the heavy nature of the liquor, and has amounted to 5 in. in 6 bays of a 12 ft. diameter washer when passing 6½ million c.ft. per diem. In this particular washer, however, the gas traverses the two halves of a brush section in series, and it is believed that in later washers the passage through the brush section is in parallel.

It was soon discovered that the efficiency of individual bays of the washer varied considerably, and a remarkably good extraction of water vapour was found in the first, second, and third compartments. Typical tests are given in the following table, which shows that, of the water removed, over 98 p.ct. in winter and 95 p.ct. in summer comes down in the first three bays:

Efficiency of Individual Bays of Chloride Washer.

	—	Dew-Point. °Fahr.	Water Vapour, Grains per 100 C.Ft.	Water Removed, Grains per 100 C.Ft.	P.Ct. Drying in Bay.	P.Ct. of Total Drying in Bay.
A. Winter (atmospheric temperature, 37° Fahr.)	Inlet to washer	50·5	4·09	..	..	..
	Outlet of Bay No. 1	39·2	2·64	1·45	35·4	68·4
	" " " 2	34·8	2·22	0·42	10·3	19·8
	" " " 3	32·3	2·00	0·22	5·4	10·4
	" " " 4	32·1	1·98	0·02	0·5	1·0
	" " " 5	31·9	1·97	0·01	0·2	0·4
	" " " 6	31·9	1·97	*Nil*	*Nil*	*Nil*
B. Summer (atmospheric temperature, 63° Fahr.)	Inlet to washer	64·2	6·75	..	..	..
	Outlet of Bay No. 1	47·2	3·60	3·15	46·7	79·2
	" " " 2	45·1	3·33	0·27	4·0	6·8
	" " " 3	42·1	2·96	0·37	5·5	9·3
	" " " 4	41·0	2·84	0·12	1·8	3·0
	" " " 5	40·8	2·81	0·03	0·4	0·7
	" " " 6	40·4	2·77	0·04	0·6	1·0

In view of a warning by Sperr ("JOURNAL," Vol. 181, p. 192) as to the possibility of corrosion by chloride liquor, a portion of the steel main at the outlet of the drying washer was cut away in February, 1928, and has again been examined during the present month.

It is satisfactory to note that neither the steel main nor the cast-iron parts of the outlet valve show any definite signs of corrosion, though a small quantity of liquor containing chloride was found on the main and also in the syphon on the outlet of the naphthalene washer. In any case serious corrosion would not be expected, since weak calcium chloride solution is almost free from action on iron and steel, and its action decreases as the chloride becomes stronger. It is a well known fact that concentrated chloride brine has been used in the circulating pipes of refrigerating plants for many years without trouble.

The cost of gas dehydration varies considerably according to the size of the plant and the quantity of gas treated. At Portsmouth the costs are as follows:

	s.	d.			
Capital and depreciation	6	0	per million c.ft.		
Steam	2	6	"	"	"
Calcium chloride (losses)	0	3	"	"	"
Oil, grease, &c.	0	3	"	"	"
Labour and supervision	0	6	"	"	"
	9	6	"	"	"

= 0·026d. per therm.

The above figures refer to a plant capable of treating 6 to 7 million c.ft. of gas per diem.

Other costs have been published for smaller works, two of which are given below:

	s.	d.			
(*a*) 1 million c.ft. per diem	19	3	per million c.ft.		
(*b*) 1½ " " "	20	2	"	"	"

In any case, therefore, the cost may be said to be almost negligible, even on comparatively small works.

An interesting point is the life of the oil film. A new 2-million spirally-guided holder was put into commission at the Hilsea Works in June, 1926. A film of ¾-in. of filming oil was added. Quite recently this holder has been opened out, and it was found that the oil film had been reduced to ½ in.—a loss of 2000 gallons in three years. This loss was to a certain extent expected, as oil had been found on the holder tank, and on one occasion pumped back into the holder. A second holder of 1½ million c.ft. capacity has since been opened out, and it was found that a similar oil film introduced just over two years ago had almost disappeared. The means by which the oil escapes from the holder forms a very interesting problem. There are no leaks in this case, and no blowing has occurred on un-cupping.

Special filming oil has been used so far, but the experience of other undertakings seems to indicate that gas oil, which is, of course, much cheaper, is equally effective as a protective layer between the gas and the water.

At Portsmouth the difference in the dew-points at inlet and outlet of the gasholders remains at 2° Fahr. provided the holders are worked steadily, but on occasions when working "in and out" of the gasholder, causing the bell to rise and fall fairly rapidly, the difference has increased to some 4° to 9° Fahr. It is not clear whether this is due to the breaking of a thin oil film or to evaporation inside the holder sheeting.

The results of gas drying have been entirely satisfactory. In the outlying districts, which are supplied with dry gas, the dew-points at the extreme ends of the mains remain within a few degrees of that of the gas leaving the works, and it may be added that a number of leaky mains have been located by means of dew-point tests. Typical figures are given in the following table:

Position.	Distance from Works. Miles.	Test on District Gas. Dry Bulb. °Fahr.	Test on District Gas. Dew-Point. °Fahr.	Dew-Point at Gasholder Outlet. °Fahr.
East Southsea	3¼	65·8	42·8	41·2
Portchester	4½	66·8	43·3	40·2
Waterlooville	5	64·6	42·2	40·2
Emsworth	8	69·6	42·3	40·7

The above figures are averages of regular tests over several months. These show that the increase in dew-point from the gasholder to the district mains does not exceed 2° Fahr. with the exception of Portchester. In this case the tests were taken on the extreme end of the main—a "dead end"—and experience shows that this may account for the somewhat higher difference of 3·1°.

In expressing the results of gas drying plant it is the custom at Portsmouth to state the "margin of safety," which is the difference between the dew-point of the gas and the atmospheric temperature. This is not strictly correct, since the gas is not necessarily reduced to atmospheric temperature in its passage through the distribution system. On the other hand, it may be at times somewhat cooler than the atmosphere. Observations taken by Mr. Robertson, of Bristol, show, however, a not very considerable lag between the temperatures of the air and of the ground at a depth of 2 ft. Therefore, given a sufficiently large margin of safety, it would appear that the results expressed on that basis are sufficiently accurate for practical purposes. It is not easy to devise a formula for efficiency based on actual water content.

The practical results may be summarized as follows.

Complaints of water in mains and services (see footnote) have fallen considerably, and are as follows:

	Total.	Average per Month.
12 months prior to starting "Dri-Gas" plant	5770	481
12 months after starting "Dri-Gas" plant	2264	202
Subsequent 8 months	1012	127

These figures are for the whole of the district of supply (64,000 consumers) and mean therefore that, as a result of drying 65 p.ct. of the make, water complaints have been reduced by about 74 p.ct. The latter figure is explained by the fact that some of the dry gas is mixed with saturated gas in the Rudmore gasholder, the dew-point in which averages 5° to 6° Fahr. below atmospheric temperature.

The effect of dry gas was particularly noticeable during the cold spell in February last, when the districts which were supplied with dehydrated gas were entirely free from frozen lamp services and the other troubles experienced in the remainder of the area.

An appreciable reduction in the syphon pumping has been effected, and there is practically no water in the outlying syphons—in fact, the motor van with tank and pump, which was formerly fully employed in syphon pumping, is now available for a considerable portion of the week for ordinary transport, particularly in connection with escape work.

It is too early to give any definite results with regard to corrosion, but it can be said with confidence that no deleterious action of the dry gas on the meters or meter parts has been noticed.

No undue leakage from mains has been apparent, though it should be remembered that the dry gas districts are supplied by comparatively new mains, and the extension of the pro-

cess to the older portions of the district may reverse this experience. Leakage from broken mains, &c., is rather more easily detected, since the ground in the vicinity of the leak is rapidly dried by the escaping gas, and becomes powdery and easily penetrated.

A further practical detail is the effect of dry gas on gas bags used when cutting out a main. Bags of the ordinary canvas-covered type, though wetted before being placed in position, rapidly become dry during the progress of the work, and need careful watching.

The increased efficiency of naphthalene removal from dry gas will be referred to later.

Since the adoption of the process it was thought that some trouble was occurring from the drying of rust in mains and services, but fortunately such troubles did not prove very serious. A thorough investigation into the question was undertaken, and the following conclusions were arrived at:

> At a gas velocity of up to 10 ft. per second, particles of rust whose size is less than 200 mesh can be carried to the extent of 0·1 grammes per 100 c.ft. There is no evidence that this dust has any harmful effects on meters.
>
> It appears that a trace of oil in the gas has considerable effect in preventing the fine rust being picked up.
>
> The samples of rust from services, and from meters, which were received were too coarse in grading to have been carried forward by the gas, particularly as its velocity in the service is probably lower than either before or after that point.

The brown stain noticed by others on incandescent mantles and traced to the formation of iron carbonyl, has been noticed in only one instance. In this case two miles of 8-in. steel main had been laid to supply a new district, and the trouble was cured by introducing paraffin from a portable atomizer at various points along the main.

It has been the custom at Portsmouth to atomize paraffin into the mains for at least ten years; and this practice is being continued at heavy load hours. The quantity of paraffin introduced is from 5 to 10 galls. per million c.ft. of the total output, and the reasons for its introduction are primarily to keep down rust which may exist in the older mains and services, and to ensure that old naphthalene deposits remain coated with a film of oil. It is considered essential to provide this film, as dry naphthalene-free gas is obviously the best possible carrier of naphthalene, and without the introduction of oil there is no doubt that old deposits which are known to exist in many parts of the district would be rapidly picked up and cause considerable trouble.

At least one plant is now in operation in which the drying reagent is crude glycerin. The vapour pressure of 86 p.ct. glycerin is about the same as, or a little lower than, that of 80° Tw. calcium chloride, and is still further reduced by the addition of salt. It would be interesting to have working details of this process, of which the writer has had no actual experience. An advantage appears to be the avoidance of solidification; the disadvantages are that glycerin must be reconcentrated under a vacuum (entailing the use of an additional pump), that it is considerably more viscous than chloride liquor, and that the published figure for glycerin loss is 6·4d. per million c.ft., against our 3·1d. for loss of chloride.

The effect of gas drying on gas quality is still under discussion in official quarters, and it is therefore unnecessary to call attention to the matter except to point out that while the gas undertaking receives no benefit from the increase in calorific value (of up to 1 p.ct.), it is compelled to suffer an equal loss in unaccounted-for gas. In this connection it may be useful to quote the words used by the Sub-Committee of the National Fuel and Power Committee, which were accepted by the full National Committee and presented in their report to the President of the Board of Trade.

> We understand that the Gas Referees would find no difficulty in prescribing a means of testing artificially dried gas; and inasmuch as it is desirable that the commodity should be tested in the form in which it is supplied for use, we are of opinion that the Act should be amended to permit the Referees to prescribe a means of testing gas in the form in which it is sent out to consumers.

In conclusion a word on naphthalene removal may be interesting, as this subject is closely bound up with gas drying. Naphthalene washing was commenced at Hilsea Works in December, 1924, and at Flathouse in September, 1926, and the following figures over the whole district of supply speak for themselves.

Naphthalene Complaints.

[See footnote.]

Year.	Total Number of Complaints.	Average per Month.
1922	10,556	880
1923	14,734	1227
1925	4,373	364
1926	1,692	141
1927	2,138	178
1928	557	46
1929 (January to May inclusive)	279	56

Gas drying has resulted in a very much great efficiency of the naphthalene washer. This is due no doubt to:

(1) Absence of water from the brushes in the naphthalene washer.

(2) The low temperature of the gas leaving the chloride washer.

(3) The deposition of naphthalene in the chloride washer.

In the naphthalene half of the washer, the quantity of that impurity is reduced from 5 grains to under half a grain by the use of only 7 galls. of gas oil per million c.ft. in winter and 12 galls. in summer—a reduction of about 40 p.ct. on the oil used when washing saturated gas. It may be thought that since the spent oil is returned to the water gas plant, such a reduction does not constitute a very great advantage. This is true to a certain extent, but at least the handling of the additional oil is saved.

Footnote.—The figures for water, naphthalene, and rust complaints given in these notes are approximate only. Every effort has been made to educate the fitters in this matter, but the difficulty of differentiating between the three kinds of stoppage will be appreciated. The figures given above are sufficiently accurate to give a reliable idea of the improvement effected.

MOORE GAS GENERATOR

To be Manufactured at Kilmarnock.

We learn that Messrs. Andrew Barclay, Sons, & Co., Ltd., who have acquired an exclusive licence to manufacture the Moore patent gas generator, intend to carry out this work at the Caledonia Works, Kilmarnock.

The Moore generator is designed in units to suit any size of gas-works. The capital, working, and maintenance charges are low, and no special class of labour is required to operate the plant. The floor space occupied is very small for the capacity of the generator.

The plant is unusually flexible in operation, and produces large volumes of gas per ton of coal.

A high recovery of coke and tar can be obtained, and the quantity of these can be varied as required to meet the demand for such residuals. If desirable, the whole of the tar and the coke can be embraced in gas production. Coal gas, blue water gas, carburetted gas, or mixed gas, in any required proportions, can be produced, or the fuel can be totally gasified with or without use of liquid enrichers. When liquid enrichers are used no separate carburettor is required.

The plant can be started up from cold in less than two hours, and can be operated continuously or intermittently for any period required. After being shut down for the night, it can be started into full work the next day in five or ten minutes.

The new generator has been thoroughly tried out over a period of eighteen months, during which it has been the mainstay of the gas-works in an important coast town. A recent examination showed that the effects of tear and wear over this period were almost negligible. The results of special tests recently made are considered extremely satisfactory.

Benzole Refining Process.—A novel process for benzole refining is claimed by the Société du Gaz de Paris (French Patent 655,899 of 1927). The vapours distilling up to 145° to 400° are directed over potash incorporated with a binder which removes the diolefines, and then over alkali or alkaline earth sulphides which remove the sulphur products.

"The Nickel Bulletin."—This is a new monthly publication incorporating the Mond Nickel Bulletin, published by the Research and Development Department of the Mond Nickel Company, Ltd. (Imperial Chemical House, S.W. 1), and the Literature Reference Memoranda of the Bureau of Information of Nickel, Ltd. The Bulletin is intended to be an instrument of real service to all who are in any way interested in the subject of nickel and its alloys, and will consist mainly of a collection of abstracts of current information upon all branches of the subject. The promoters hope that all those who are interested in nickel and its alloys will find the Bulletin to be of value, and they would like to enlist their co-operation in making it just what will be of the greatest assistance, and will welcome, therefore, suggestions regarding the scope of the matter which is included and the method of its presentation.

HINTS ON RATING RELIEF.

By an Ex-Civil Servant.

During the next few weeks, the Special Valuation Lists which it has been necessary to prepare under the Rating and Valuation (Apportionment) Act, 1928, relating to industrial hereditaments, will be "placed on deposit," for public inspection, by most local authorities throughout the country. These should be inspected by everyone interested, to see if entries are in consonance with claims made. Those who are not satisfied with conclusions entered on the lists, and those who have omitted to claim for inclusion, and now wish to do so, must proceed by way of "objection" on forms provided by the Assessment Committee. For most who have made a claim, there should be no difficulty; the chief point to remember being to watch for the "apportionment of values," as to amounts attributed to "industrial" and to "non-industrial" portions of the premises. With regard to the latter, these will embrace, generally speaking, those parts not subject to control under the Factory Acts; but the Ministry of Health also instructs that the "non-industrial" parts arise through the proviso to the Factory Act, 1901, section 149, which reads as follows:

(*a*) Any place within the close, curtilage, or precincts which is solely used for some purpose other than the manufacturing process or handicraft carried on in the factory or workshop; and
(*b*) any room solely used for the purpose of sleeping therein, is deemed not to form part of the factory or workshop.

In addition, further instructions have been issued by the Ministry, to wit:

> Offices used by the general administrative, clerical, or accounting staff, or research laboratories, drawing or designing rooms, caretaker's residence, showrooms, salerooms, &c., do not normally form part of the factory, nor does a recreation ground.
>
> On the other hand, courtyards, staircases, passages, hoists, lavatories, cloak rooms, rest rooms, surgeries, and any other accommodation provided in order to comply with the requirements of the Factory Acts, warehouses or packing sheds, and tramroads, sidings, and dock basins inside are part of the factory.

Also in the Apportionment Act, 1928, it specifically mentions that any place within the boundaries of the factory used for the housing and maintenance of road vehicles, or as stables, though part of premises, shall not be deemed to be part of the factory.

But if the premises scheduled as for "other purposes"—*i.e.*, non-industrial—do not in value exceed 10 p.ct. of the industrial portions, then the premises will be considered wholly industrial, and be subject to the 75 p.ct. rebate for the whole "net annual value." If the 10 p.ct. allowed is exceeded, then only that amount in excess of the 10 p.ct. will not carry the 75 p.ct. rebate.

Also, if the premises do not exceed £50 in "net annual value," the premises shall be entered as wholly industrial likewise, and so carry the rebate.

For occupiers of obviously industrial premises, everything should be plain sailing; but for many doubtless a certain amount of confusion will arise. The Act defines an "industrial hereditament" as follows:

> "Means a hereditament occupied and used as a mine or mineral railway or . . . as a factory or workshop. . . ."

But the expression "industrial hereditament" does not include a hereditament, occupied and used as a "factory" or "workshop," if it is primarily occupied and used for the following purposes:

(*a*) A dwelling house.
(*b*) A retail shop.
(*c*) A distributive wholesale business.
(*d*) Storage.
(*e*) A public supply undertaking.
(*f*) Any other purposes, whether or not similar to any of the foregoing, which are not those of a "factory" or "workshop."

In this article, the writer will endeavour to explain these provisos, as there have been certain instructions issued by the Ministry of Health on these points, and the information may be useful.

Proviso (*a*).—The suggestion is made that if one or two rooms, or a shed or something similar at back of the premises, are used as a workshop, then the premises would be considered as "primarily" used as a dwelling house, and exclusion would follow. But there is also an instruction that in the case of premises used as a dwelling house and/or as a retail shop, and partly registered as a factory or workshop under the Factory Acts, some regard should be taken as to description previously used in existing valuation lists, as to the primary portion of the premises.

Proviso (*b*).—The expression "retail shop" includes any premises of a similar character where "retail business," including repair work, is carried on. The instruction, however, states that this does not necessarily mean that "repairing workshops" will be excluded, but that, if small repairs are executed in connection with a retail shop, where the retail business is the most important, then, as the premises are primarily used as a retail shop, they would be excluded. Contrariwise, if the repairing workshop portion is the most important, then presumably these premises would be included.

Proviso (*c*).—In this case the instructions are rather vague, to the effect that if the premises are used for distributive wholesale business between manufacturer and retailer, with no manufacturing process carried on in the premises, then apparently they would be excluded.

Proviso (*d*).—The suggestions applying to this are more explicit, as exclusion would only follow if premises are primarily used for storage—*i.e.*, for storage as an end in itself, and not ancillary to manufacture on the premises, as there is always considerable space required for raw materials "before" and for the finished article "after" manufacture in most businesses.

Another instruction follows that premises not normally regarded as manufacturing premises, and admittedly used for packing and distribution, may, if the articles distributed are subjected on the premises to some process which is not merely ancillary to distribution, be held to be "primarily" used for that purpose, and not "primarily" used for distributive purposes, and so be qualified for inclusion as an "industrial hereditament."

The rules stress the fact that much reliance must be placed upon the word "primarily," and the Ministry of Health add that this word was used in the Act advisedly, as being more expressive than some such word as "mainly." The Ministry also instructs that it is impossible for any general rule to be laid down, and each particular hereditament must be judged solely on its own merits. An instruction, however, does state that, generally speaking, no premises which have no parts registered under the Factory Acts will be eligible for inclusion for the rebate; but it does not necessarily follow that this will be so, any more than that premises which are so registered will be included, as provisos (*a*) to (*f*) may intervene.

It cannot be emphasized too much, however, that the sole responsible body at the outset is the Rating Authority—a Committee of the Local Council—who have wide discretionary powers, joined afterwards under this Act by another Officer, the Revenue Officer, who comes into the Act by reason that the Exchequer makes grants to the local authorities in consequence of the rebate allowed of 75 p.ct. These bodies must agree. Failing agreement, the Assessment Committee must sit in judgment; and in such an event the occupier and the two bodies named will be notified of the date and given the opportunity of calling witnesses.

Anyone who has the slightest doubt about his premises should secure a pronouncement by proceeding by way of objection, as previously explained, if no claim has been entered.

The general definitions of factory and workshop are contained in the 1901 Factory Act, section 149. Broadly speaking, a factory means any premises where any manual labour is exercised by way of trade . . . or . . . incidental to making, altering, repairing, ornamenting, finishing of an article, or the adapting for sale of any article, where steam, water, or other mechanical power is used.

The expression "workshop" in the same way means any premises, room, or place, not being a factory, where any manual labour is exercised by way of trade . . . or . . . incidental to the making, repairing, altering, ornamenting, finishing of an article, or the adapting for sale of any article, and to or over which premises, room, or place the employer of the persons working therein has right of access and control.

There is no doubt that the intention of the framers of the Act is that a wider definition shall obtain than in the Factory Acts. By section 69 of the Local Government Act, section 3 (2) of the Apportionment Act is made to read as follows:

> For the purposes of this Act, a hereditament shall not be deemed not to be occupied and used as a factory or workshop by reason only of the fact that the owner or occupier of the hereditament is the only person working therein, or that no other person working therein is in his employment.

This, of course, is aimed at bringing in the one-man business worker, if other conditions make premises eligible for inclusion.

THE COKING OF COAL.

By M. BARASH, M.Sc. (Tech.), F.I.C., Research Department, West's Gas Improvement Company, Ltd.

Read on Friday last before the Society of Chemical Industry at the Annual Meeting in Manchester.

It is intended in this paper to present a summary of a series of investigations which has been carried out by the author during the last decade into the influence of certain constituents of coal and the influence of certain treatments of coal upon the conversion of coal into coke. Further, it is proposed briefly to review a number of recent publications dealing with the "coking" of coal, the objects in this case being to indicate the extent to which the deductions drawn from the above investigations have been confirmed, and to show that in other cases they are of some value in solving the somewhat perplexing phenomena observed and left unexplained by other investigators of the subject.

Many authors have propounded theories attempting to explain the visible manifestation of coke production. It would be redundant here to enter into details with regard to this outward evidence of what happens when a piece of coal* is heated. Stated crudely, coking consists of the binding together, to a greater or less extent, through the application of heat, of infusible material present in coal by the residue from a thermal decomposition of certain fusible carbonaceous constituents of the coal; gaseous products and vapours being continuously evolved from the mass during this process. The appearance of the resulting product under normal conditions is readily visualized as consisting essentially of a cellular, vitrified mass, mainly carbonaceous, enclosing and cementing together the matter which has not melted during the process. The structure of the coke mass has formed the subject of many interesting papers. Kreulen[1] describes it aptly as an "onion" or layer formation. To anyone who has examined the coke button produced in the laboratory crucible test this structure is familiar. It can also be traced in the wedge-shaped pieces of coke produced in a gas retort or coke oven. The piece of coke was formed with the narrow edge towards or at the centre of the charge, and the wide end against the hot wall. A section of such a piece of coke shows concentric layers, with the point of the wedge as centre, similar to the annular rings in a cross-section of a tree trunk. Knowing that coal is a poor conductor of heat, and that heating is generally applied from the outside of the mass of coal which it is intended to carbonize, it is evident, therefore, that coking will take place in layers; and this peculiarity of the general structure of coke is to be expected. It is fortunate, however, that the cementing material is of such a nature that the layers of coke are more firmly knitted together than would be expected from the above analogies.

The "swelling" of coal during carbonization has also formed the subject of many searching investigations and controversies. Essentially, it is due to the inflation or frothing of the fused material by the gases being evolved during the destructive distillation of the coal. The extent of this swelling will naturally be influenced to a remarkable extent by a large number of factors, chief among which may be mentioned the nature of the fusible and infusible constituents of the particular coal, the rate of heating, and the limitations set by the confining space in which carbonization is taking place. It is the study and control of these factors on which depends the successful production of suitable cokes for specific purposes, industrial and domestic.

It is intended in this paper to deal particularly with the fundamental principles of coking rather than with the above more or less apparent manifestations of the changes which occur during the process. It is not intended either to deal with the minor influences exerted by the presence of inorganic foreign matter, ash, sulphur, and phosphorus, or with the special precautions necessary in order to ensure the production of special types of coke and the elimination as far as possible of undesirable qualities or constituents.

DEFINITION OF TERMS.

Reference has already been made to the two terms "carbonization" and "coking" in connection with the conversion of coal into coke. A third, and most important, term, particularly in connection with this paper, is "agglutination;" and it would be useful at this point to define these terms and their cognate derivatives in order to indicate the interdependence of the three processes involved in coke production.

"Carbonization" is a general term applied to the heat treatment of carbonaceous materials (generally coals). The treatment may be partial or ultimate, depending upon the nature of the residue required, and results in the evolution of gases and vapours, leaving a residue progressively higher in carbon concentration as the treatment is prolonged and as the temperature is increased. It is essentially a process of destructive fractional distillation, involving in the residue a progressive formation and destruction of ever more highly complicated organic molecules. Ultimately the point is approached, though probably never quite attained, where the organic residue consists of elemental carbon adulterated with the non-volatile inorganic residues derived from the original ash content of the coal.

It will be observed that no reference is made under this term to the appearance or structure of the residue.

The term "coking" is applied to the production by the process of carbonization of a more or less coherent residue of coke from such classes of coals which have a tendency to melt during certain phases in the heat treatment. One would not, therefore, for example, in ordinary circumstances, refer to the thermal decomposition of lignites or anthracites as "coking," though "carbonization" would be correct.

"Coking power" is thus used to define the property which a coal possesses of producing a more or less coherent coke when the coal is carbonized alone. The term is used industrially to classify coals broadly into two main groups—coking coals (that is, coals of good coking power) and non-coking coals (that is, coals of very poor or no coking power).

Several methods have been devised for the evaluation of the coking power of a coal, consisting usually of a determination of the crushing strength of a small test piece of the coke prepared under specified conditions from the coal. Such a numerical value or quantitative index of the strength of the coke produced on carbonizing a coal under standard conditions, being the result of testing the strength of the coke in some specific manner, is termed the "coking value" of the coal.

It has already been stated that coking consists of the binding together, during carbonization, of infusible material by residues from certain fusible constituents of coal. These fusible constituents which produce such cementing material are termed "agglutinants," and the process involved in coking, for which these are responsible, is termed "agglutination." There is considerable evidence that in many coals there is an excess of agglutinant over the amount required to form a well-cohering coke. Such coals generally yield rather weak, friable cokes if carbonized alone and in their natural condition. They may, however, be made to yield considerably better cokes by (*a*) removal or destruction of a portion of the agglutinants, (*b*) weathering, chemical or other special treatment prior to carbonization, (*c*) special treatment during carbonization, or (*d*) blending with a non-coking coal, coke breeze, or other such infusible or inert material. These methods of treatment will be discussed later, but it now becomes obvious that it is highly desirable to devise a method of studying and measuring the "agglutinating power" of a coal. The "agglutinating value" of a coal is thus a quantitative index or numerical measure of the agglutinating power or cementing property of the coal as manifested in the production of a coherent coke on carbonizing a mixture of the coal with (*a*) another coal which carbonized alone would yield a non-coherent coke, or (*b*) with some inert industrial carbonaceous material such as coke breeze, anthracite dust, charcoal, &c. That the importance of this determination has been abundantly realized is evidenced by the large number of publications which have appeared recently dealing with and criticizing proposed methods. A brief historical survey and list of references to these was given by the author in the J.S.C.I. 1926[2]. As the result of a critical examination of these methods coupled with personal experimental and industrial investigation the author has devised a method,[2, 3], for the determination of agglutinating value which has proved of considerable value in the study, which is to be described, of the coking and agglutinating properties of coals and coal constituents. In this an attempt has been made to standardize and simplify all the details of the determination as far as possible. References to agglutinating values in this paper will all refer to determinations carried out according to this method.

Briefly, the method consists of intimately mixing the powdered coal with varying proportions of powdered electrode carbon, and carbonizing the mixture under well-defined conditions. The proportion of coal to inert material ($1 : x$) in the mixture containing a minimum of the latter constituent, and which gives an absolutely non-coherent powder when gently

* As implied from the title of this paper, the term "coal" will only be used here as a general designation of such bituminous coals (as distinguished from anthracites, lignites, &c.) as would be used industrially for the production of coke.

[1] D. J. W. Kreulen, "A Laboratory Study of the Formation and Structure of Coke." "Fuel," April, 1927, pp. 171-182.

[2] M. Barash, "A Contribution to the Study of the Coking of Coals, and a Proposed Standard Method for the Determination of Agglutinating Value." J.S.C.I., June 4, 1926, 45, pp. 151T-160T. J.S.C.I., June 18, 1926, 45, pp. 176T-177T. "GAS JOURNAL," Vol. 173, p. 276.

[3] M. Barash, "Scientific Control of Carbonization, with Particular Regard to the Agglutinating Power of Coal." "GAS JOURNAL," Coke Competition No. 1925, pp. 17-27. Reprinted, "Fuel," Dec., 1927, pp. 532-551.

emptied from the carbonizing vessel, is termed the agglutinating value of the coal.

Incidentally, before leaving this subject of the definition of terms, it may be stated that the use of the terms "caking power," "caking value," and "caking index" as synonyms respectively of coking power, coking value, and agglutinating value is to be deprecated as being redundant and likely to lead to misconception.

Constitution of Coal.

It would be futile to attempt within a limited paper to deal in any detail with theories which have been published or with the controversies which have arisen with regard to the constitution of coal. It is, however, essential, in order to make the chief portion of this paper intelligible to the general reader, to give a brief indication of the author's impression of the origin and constitution of coal. In their now well-known "Monograph on the Constitution of Coal,"[4] Drs. Marie C. Stopes and R. V. Wheeler define coal as:

> . . . a compact stratified mass of "mummified plants (which have in part suffered arrested decay to varying degrees of completeness) free from all save a very low percentage of foreign matter.

In their summing-up of what they consider to be the best founded of modern researches, coupled with their own observations on the constitution of coal, these authors conclude that:

> . . . coal is a conglomerate of morphologically organized plant tissues, natural plant substances devoid of morphological organization (such, for instance, as "resin"), together with the degradation products of a portion of the plant tissue and cell contents comminuted, morphologically disorganized, or present in the form of varying members of the ulmin group. . . . The subtlety and complexity of the substances present in coal are beyond present technique to unravel, but more can be hoped for than the first very rough separation into alpha, beta, and gamma substances. Where individual tissues or identifiable parts can be isolated, the resulting products of which they are the source should be determinable. Then, fraction after fraction, the nature of each portion of the opaque coal mass may be made clear.

One therefore visualizes that, owing to strong metamorphic action (mainly heavy pressure), the coal-forming plants have been formed into a foliated (or stratified) mass of cell and fibre tissue.

The novel claim is now advanced here that there is sufficient evidence to show that coal immediately after mining, being exposed to atmospheric conditions and freed from the pressure conditions under which it has been formed, begins to "breathe," open out (or "defoliate"), and change its physical condition throughout its whole mass. The coal, under normal conditions, reacts continuously though very slowly to this freedom, but potentially it is highly reactive. Thus, this reaction may be considerably speeded up by outside influences, or a highly "defoliated" condition may be readily and almost instantaneously brought about by some highly penetrative influence such as chemical action. It must be emphasized that this defoliation does not necessarily mean a complete rupture of the coal mass (though this tendency is apparent) but a definite modification of the physical condition of the coal, manifested particularly by an increased porosity or absorptive capacity of the material.

Evidence in support of this conclusion and its particular bearing upon the coking propensities of coal will be indicated later.

Constituents of Coal Responsible for Coking.

Chiefly with the object of elucidating the constituents of coal which are responsible for coking and agglutination, considerable advances have been made beyond the "first rough separation of coal into alpha, beta, and gamma substances." A voluminous amount of literature on the subject has resulted, and only brief reference can be made here to several of the outstanding deductions which have been arrived at.

Dr. Wheeler and his co-workers, [5], [6], [7], [8], have recently resolved the gamma constituents further, by means of organic solvents into fractions which they have classified as:

> $\gamma 1$—mainly hydrocarbons.
> $\gamma 2$—resinols, resines, and resenes.
> $\gamma 3$ and $\gamma 4$—resin-like bodies.

and conclude that—

> the resins, and to a certain extent, the hydrocarbons, appear to play the part of agglutinating materials, but it is clear that the character of the infusible part of the coal is of equal importance.

It is particularly desired to draw attention to the latter observation with regard to the infusible part of the coal, to which further reference will be made later. This has been particularly stressed by the author in previous publications [2], [3].

Prof. Bone and his co-workers[9] in this country, and F. Fischer and his collaborators[10] in Germany, have added considerably to this branch of researches on coal. These investigators, by an alternative method of resolution of the coal substance, have isolated fractions which they term "oily bitumen" and "solid bitumen," apparently similar in characteristics to the gamma-compounds. The former school of investigators claim that the coking propensities of bituminous coals are approximately proportional to their respective yields of "solid bitumen," and that this fraction exhibits considerable binding properties, while the "oily bitumen" possesses little or no agglutinating power. The German workers, on the other hand, claim considerable evidence in support of their contention that the "oily bitumen" is mainly responsible for the coking (*i.e.*, binding) property of the original coal, while swelling is due to the "solid bitumen."

Investigations of a similar nature and productive of very interesting and valuable results have been carried out in America by Prof. Parr and Hadley[11], to which reference will be made later.

Incidentally, it must be realized that the isolation of definite constituents as originally present in coal is a very complicated and still little understood procedure, as it is fairly generally admitted that little is as yet known with regard to the extent to which all these classes of compounds are affected in properties and altered in composition during the treatment of coal under varying conditions of temperature and pressure with so-called "solvents."

In the investigations which are to be described here, separation of the coals into alpha, beta, and gamma fractions was adopted; but as far as the conclusions are concerned, only two classes of compounds need be considered—viz.: (*a*) Fusible compounds, responsible for agglutination, and (*b*) non-fusible compounds (sometimes termed "inert" material). It is a curious fact, though it has apparently not been commented upon before, that the portion of coal which is soluble (or dispersible) in organic solvents always corresponds with the fusible constituents.

In the foregoing an attempt has been made to indicate the exact meanings which should be attached to the phraseology used in the following statement of the conclusions arrived at by the author from his investigations on the coking of coal.

The unusual procedure is now adopted of enumerating first these conclusions, and then following with the experimental and other evidence in their support.

Fundamentals in the Coking of Coal.

(1) The fusible portion of coal represented by the "gamma-fraction" (soluble in pyridine and in chloroform) is the cementing material to which is mainly attributable the coking and agglutinating properties of coal.

(1a) The portion of coal corresponding to the "beta-fraction" (soluble in pyridine but not in chloroform) contributes to an appreciable extent towards these properties, being also fusible under carbonizing conditions.

(2) The manifestation of these properties by these two groups of constituents (1) and (1a) is influenced to a very marked degree by the type or condition of the infusible matter, corresponding to the "alpha-fraction" (insoluble in pyridine), which predominates in the coal mass and with which the fusible compounds are associated.

(3) Treatment of coal, such as weathering or the action of a large variety of chemical reagents, which reduces or destroys the coking and agglutinating power, effects this through some modification (disintegration, &c.) produced in the infusible matter. The infusible matter, in the process, acquires an enhanced avidity (or absorptive capacity) for the molten cementing material, so that during carbonization the amount of agglutinant available for binding together the carbonized residue is materially reduced.

(4) Such treatment as referred to above (3) only affects the properties of the agglutinant to a comparatively small degree, if at all.

(5) The difference between highly-coking and non-coking (or poorly-coking) coals depends essentially upon the physical condition of the non-fusible compounds corresponding to the alpha-fraction, and is only dependent to a limited extent upon the amount of agglutinant present.

Experimental.

The method of measuring agglutinating power, to which reference has previously been made, has made possible the

[4] M. C. Stopes and R. V. Wheeler, "Monograph on the Constitution of Coal." H.M. Stationery Office, London, 1918. "Fuel," 1924, 3, pp. 3-11, 63-67, 97-105, &c., to 439-452.

[5] C. Cockram and R. V. Wheeler, "Resins in Coal and their Effect upon its Properties." "Fuel," 1927, pp. 425-428.

[6] R. V. Wheeler, "Chemistry of Coal." J.S.C.I., 1927, pp. 848-854.

[7] R. V. Wheeler, "Chemistry of Coal." "Fuel," 1927, pp. 506-511.

[8] W. Francis and R. V. Wheeler, "Composition of Coal—its Rational Analysis." J.C.S., 1928, pp. 2967-2969.

[9] W. A. Bone and others—P.R.S., 1924, A105, pp. 608-625. J.S.C.I., 1925, 44, 291-299 T. J.S.C.I., 1926, 45, 646-647. P.R.S., 1926, A110, 537-542, &c.

[10] F. Fischer and others, Ber., 1916, 49, pp. 1460-1468. Brennstoff-Chemie, 1925, pp. 33-34, 349-354. Also P. Damm-Gluckauf, 1928, 64, pp. 1073-1080, 1105-1111. "Fuel," 1929, 8, 163-177.

[11] S. W. Parr and H. F. Hadley, "Analysis of Coal with Phenol as a Solvent." "Fuel," 1925, 4, pp. 31-38, 49-55, 111-118.

systematic investigation and comparison of different coals and coal constituents, as well as the effect on them, from the point of view of their coking propensities, of a variety of treatments, such as weathering (natural and artificial), direct oxidation, preheating, and the action of chemical reagents under widely varying conditions. The author hopes to be able to publish the whole of the experimental details and results of these investigations in a series of papers in the near future. It is only possible in this paper to give a brief summary of the work carried out, together with a selection of the particular results relevant to the points which have been raised.

Atmospheric Oxidation.

Powdered coals were exposed in a thin layer under cover, but with free access of air, for a period of two years and samples were tested periodically. Table 1 shows that the agglutinating value decreases under these conditions at a steady rate.

Table 1.

—	Agglutinating Values.	
	Coal A.*	Coal B.*
Freshly mined coal	1 : 7	1 : 13
Exposed 3 months	1 : 6	1 : 12
,, 6 ,,	1 : 5	1 : 11
,, 12 ,,	1 : 4	1 : 9
,, 24 ,,	1 : 2	1 : 6

* For identification of coals used, see end of paper.

At the end of this period the coals were extracted with pyridine, and the extracts were compared with those from the original coals. It will be seen from Table 2 that there is no modification in the agglutinants to account for the above reduction in agglutinating value of the coals.

Table 2.

—	Coal A Extract.		Coal B Extract.	
	Yield.	Agg. Value.	Yield.	Agg. Value.
Original coal	19·3 p.ct.	1 : 23	20·5 p.ct.	1 : 50
Exposed 2 years	19·9 p.ct.	1 : 20	21·7 p.ct.	1 : 42

A stock of about 3000 tons of mixed medium coking coals (*c*), which had been left freely exposed to atmospheric conditions in an uncovered store in a gas-works yard, was found after 18 months to yield a very poor friable coke on carbonization under normal gas-works conditions.

On examination, the lumps of coal were found to be soft, and crumbled easily on handling—an indication of excessive weathering. A representative sample of this weathered coal was found on extraction to yield 22 p.ct. of pyridine soluble compounds having an agglutinating value of 1 : 19. Fresh coals containing such a measure of agglutination constituents invariably yield satisfactory cokes on carbonization under similar conditions to the above.

Preheating.

It was found that the effect of preheating coals, out of contact with air, at temperatures of 200° C., 300° C., and 400° C. for periods of from 1 to 3 hours, was progressively to destroy their coking power. For example, coal A, after three hours' heating at 200° C., produced a non-coherent residue on subsequently carbonizing in the laboratory apparatus. On extraction of a portion of this preheated coal, a yield of 16 p.ct. of beta + gamma compounds was obtained, having an agglutinating value of 1 : 18. On further heating this extract for a period of three hours at 200° C., very little decomposition was shown, and the agglutinating value was found to be 1 : 21.

At temperatures above 200° C. the modification of the infusible material indicated by the above tests was accompanied by considerable decomposition of the agglutinants.

Drying and Heating at 105° C.

Investigation showed that the removal of moisture from coal, if carried out by recognized methods of desiccation *in vacuo*, or in a current of dried air at ordinary temperature, does not affect the agglutinating value. Heating at 105° C., however, was found to have a similar (though more gradual) effect to that produced at higher temperatures.

With coals A and B, heating for 8 hours resulted in the reduction of agglutinating value from 1 : 7 to 1 : 5 and from 1 : 13 to 1 : 10 respectively, and considerably reduced coking properties. Extraction of this preheated coal with pyridine showed, as in the previous series, that the agglutinants had been practically unaffected as regards both yield and properties.

Parr and Hadley[11] have carried this investigation considerably further, and it will be seen later that their results agree remarkably with those instanced here.

Swelling.

It may be noted here, incidentally, that though the swelling properties (*i.e.*, degree of free swelling) of the coals are considerably reduced or completely destroyed by these pre-treatments, the pyridine extracts from the treated coals swell to the same extent on carbonization as the extracts from the original coals. It follows that there is a distinct relation between the swelling and agglutinating properties of coal and its constituents. This has already been referred to in a previous publication[3], but a comprehensive correlation between the swelling power and agglutinating value of coals is left for a future occasion.

Extraction and Treatment with Pyridine and Chloroform.

A variety of coals from several sources were separated into their alpha, beta, and gamma fractions by the usual methods, and these fractions were examined and tested. The alpha-compounds were found to be devoid of coking properties; though in several cases carbonization yielded a residue just cohering, probably owing to decomposition of tarry vapours in the mass, a 1 : 1 mixture with electrode carbon invariably yielded a black powder on carbonization.

The beta-compounds are similar in coking properties to the coals from which they are extracted, but are considerably more resistant to change by oxidation, preheating, &c., than the coals.

The gamma-compounds have extraordinarily high agglutinating powers, and will bind together more inert material (such as electrode carbon) than any other compound or class of compounds (other than coal constituents) which has been investigated in this connection. In other words, they are the strongest agglutinants known.

Table 3 indicates the chief properties of these three classes of coal constituents. Included for comparison are also the original coals and the "beta + gamma" fractions—*i.e.*, the pyridine-soluble portions of the coal before separation by chloroform.

Table 3.—*Properties of Alpha, Beta, and Gamma Fractions of Coal.*

—	Yield. P.Ct.	V.O.M. P.Ct.	Swelling. P.Ct.	Agg. Value.
Coal A—				
Original coal	..	32·7	100	1 : 7
Alpha fraction	82·4	30·1	−10	1 : 1
Beta ,,	12·8	35·6	300	1 : 6
Gamma ,,	7·8	80·5	..	1 : 55
Beta + gamma fraction	19·3	48·9	900	1 : 23
Coal B—				
Original coal	..	26·5	400	1 : 13
Alpha fraction	80·6	23·1	−10	1 : 1
Beta ,,	13·5	29·6	600	1 : 11
Gamma ,,	7·5	70·8	..	1 : 65
Beta + gamma fraction	20·5	39·8	2500	1 : 50
Coal D—				
Original coal	..	30·8	650	1 : 23
Alpha fraction	73·5	26·2	*Nil*	*Nil*
Beta ,,	20·1	30·3	750	1 : 18
Gamma ,,	8·2	70·2	..	1 : 80
Beta + gamma fraction	27·8	43·0	2800	1 : 55

In the above table, the swelling of the gamma-fractions is not stated. This class of compounds does not form a "coke," but on carbonization leaves as residue a thin, bright, black, brittle skin on the inner surface of the containing vessel.

Several interesting deductions accrued from the examination of these coal constituents.

The aggregates of both the swelling and agglutinating values of the three components of each coal are, in every case examined, considerably lower than the corresponding values for the original coal, indicating that the method of separation by extraction involves a partial destruction or modification of coking and agglutinating properties. This was confirmed by experiment.

On re-mixing the fractions in the proportions in which they were obtained, the resultant mixtures invariably gave considerably poorer cokes than those from the original coals. In some cases, the residues were non-coherent in spite of the presence of sufficient agglutinant to bind together a considerably larger proportion of electrode carbon than would be represented by the amount of alpha-compounds in the mixture.

Treatment of coal with pyridine or with chloroform in a manner similar to that used in the extraction processes, but without removal of the extracts, results in a progressive reduction of coking and agglutinating properties, as indicated in Table 4, for coal B.

Table 4.—*Effect of Boiling with Pyridine.*

	[Agg. Value.]
Original coal	1 : 13
After 15 hours' boiling	1 : 10
,, 33 ,,	1 : 6
,, 63 ,,	1 : 1

Treatment with chloroform is not as drastic, the agglutinating value of coal B being reduced in 63 hours from 1 : 13 to 1 : 5.

In these experiments, treatment consisted of boiling the coal for varying periods in an inert atmosphere (nitrogen) with the solvent, followed by removal of the solvent by evaporation, and, in the case of pyridine, final washing with dilute acid and water. The modified coals so obtained, after removal of a

portion for determination of the agglutinating value, were extracted in the usual manner with pyridine. Extraction was now possible in a considerably shorter time than usual, the yield of extract was generally slightly higher than from the original coal, while the agglutinating value of the extract was slightly reduced.

Coal B, from the above 63 hours' treatment with pyridine, yielded 21·3 p.ct. of pyridine extract of agglutinating value 1 : 38 when extracted for 6 hours. The period necessary for extraction of the original coal was about 40 hours for a yield of 20·5 p.ct. The main point to be observed, however, is that, though the treatment has seriously affected the coking power of the coal, it has had practically no effect on the agglutinant.

TREATMENT WITH CHEMICAL REAGENTS.

A comprehensive series of examinations was carried out on the effect of treating coals for varying periods and under varying conditions of concentration and temperature with a selection of inorganic chemical reagents including oxidizing agents, reducing agents, acids, and alkalis. In all cases reduction in the agglutinating value and in the degree of swelling resulted.

In several cases where this reduction amounted to complete destruction of agglutinating properties, the affected coals were then extracted with pyridine or chloroform, and invariably highly agglutinating compounds were readily obtained. It will be sufficient here to mention the following examples.

Coal B, after soaking for 14 days in a 1 p.ct. aqueous caustic soda solution, and then acidifying and washing, gave a product with agglutinating value of 1 : 1. Extraction of this non-coking product with pyridine yielded 28 p.ct. of extract with an agglutinating value of 1 : 26.

It may be mentioned here that in another connection the separated beta and gamma-compounds were found to be particularly resistant to the prolonged action of dilute aqueous solutions (1 p.ct. and 5 p.ct.) of caustic soda.

The effect of exposure of coal to an atmosphere of chlorine proved extraordinarily interesting, and the results obtained have led to extensive further research on the chlorination of coal. Chlorine was found to be the most active agent in destroying the coking properties of coal.

Coal B, after exposure to chlorine for 5 minutes, gave a powder on subsequent carbonization.

Coal A, normally a hard, bright coal, when exposed in lumps in an atmosphere of the gas for 15 minutes, could then be easily crumbled to powder in the fingers, and the product gave a non-coherent residue on carbonization.

Both these chlorinated coals, after washing to remove any free chlorine or hydrochloric acid, coloured pyridine a dark brown immediately they were mixed with it in the cold. On extraction they yielded agglutinants (chlorine free) indistinguishable from those obtained from the untreated coals.

(*To be concluded*).

THE SELLING PRICE OF GAS.

By Dr. G. W. ANDERSON, F.I.C.

The keen interest which is taken in the question of gas price policy has induced the writer to make a short contribution, in which attention is drawn to the inequity of a fixed service charge in certain circumstances, and the bearing of the "load factor" on the selling price of gas.

From time to time suggestions are made in regard to improving the economic position of gas undertakings by covering capital and overhead charges by a fixed service rate for gas. This charge is usually based either on the rateable value of the property supplied, or on the superficial area of occupied floor space, or on other considerations, most of which bear no direct relationship to the potential demand for gas. The recent paper of Mr. W. B. McLusky, read before the Manchester District Institution of Gas Engineers, and the discussion which followed, have brought to light a number of facts on this subject. There seems to be consensus of opinion on the inequity of a service charge founded on an arbitrary basis such as mentioned above. Indeed, it would appear that such charge cannot do more than secure a definite income to cover capital and overhead charges, without taking account of the factors influencing the selling price, which object is so successfully achieved by the devious methods and meters of electricity undertakings.

An attempt to emulate the electricity industry is evidently made at Brighouse, but it is difficult to imagine how a four-part tariff can be applied without having recourse to some complicated measuring and control apparatus.

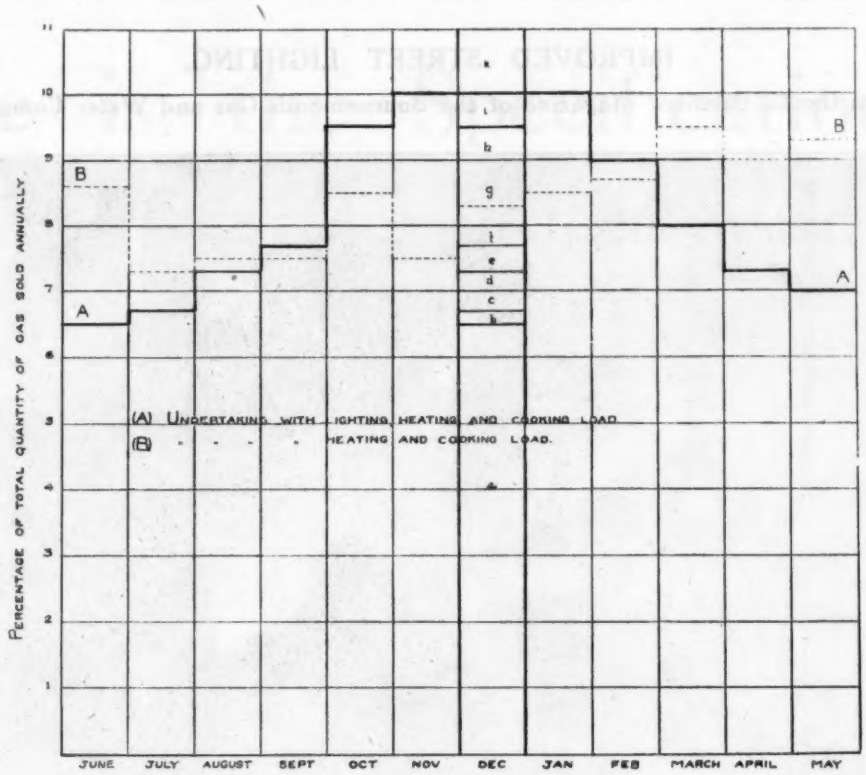
If a fixed service charge is desired, it should be based on the number and type of gas appliances installed, which can be regarded as a measure of the consumer's potential demand for gas. Such basis would leave the consumer free from any compulsion to use gas for other purposes or in other parts of his premises, beyond the quantity for which he has contracted. In cases where gas appliances are installed on hire, the service charge might conveniently include the hire for the appliances, and would thus confer on the consumer some tangible benefit which would probably appeal to a great number of consumers.

While in this, or in a similar, way a definite revenue could be ensured—provided legislation and the constitution of the individual undertaking would permit of a multiple system of charging—no improvement is likely to result from it in regard to the load factor, though, possibly, it might in the total gas consumption. The effect of the load factor on the selling price of gas, however, is greater than is often imagined.

The average annual load factor of a gas undertaking with a "mixed business" in gas consumption is to-day generally 76 p.ct.—*i.e.*, the total annual output of gas is 76 p.ct. of the potential capacity of the plant, working fully for 365 days per year. Under these conditions plant stands idle during a certain part of the year, in addition to other plant let down for repair work and renewal. The stand-by plant required for the latter purpose makes it impossible to attain a load factor of 100 p.ct.; and the optimum load factor must be computed for each undertaking so that sufficient margin is left for plant under repair and renewal. If the life of a setting is, on an average, 2000 days—the setting being repaired once during its life—to its useful life must be added 300 days (90 days for repairs and 210 days for renewal), so that the total life of a setting amounts to 2300 days. Thus $\frac{2000 \times 100}{2300}$, or 87 p.ct. of the total life of the carbonizing plant, is available for gas-making purposes, and represents the maximum load factor, which allows the requisite amount of stand-by plant for repair and renewal. Both cases—viz., the average and the optimum—are represented in the accompanying graphs, and are believed to be typical of two different classes of undertakings—viz.: (A) with a "mixed business," and (B) with an almost exclusive consumption of gas for cooking and heating. Graph (B) has been obtained from a Continental works where these conditions exist. The monthly gas output is expressed as a percentage of the total annual output, which, for the purpose of comparison, has been taken to be the same in both cases.

The influence of the "load factor" on the selling price of gas in the two examples has been determined. It is evident that in the case of the higher load factor less land and plant and smaller mains will suffice to produce and distribute the same quantity of gas per year. Assuming the capital expenditure to be proportional to the output, interest charges per therm or per unit volume of gas on land, works plant, and mains, depreciation, and repair and maintenance vary inversely as the load factor. If the total capital of the undertaking is 20d. per therm sent out, 8d. is spent on land and works plant, and 6d. on distribution plant, making a total of 14d., on which 6 p.ct. interest has to be paid. Repair and maintenance and depreciation have been taken at 2d. per therm for works plant, and 0·8d. for distribution plant, so that *in toto* 3·64d. per therm is incurred by these charges in the case of undertaking (A). The figure is reduced to $\frac{76}{87} \times 3{\cdot}64 = 3{\cdot}18$d. for undertaking (B), which would thus be able to sell its gas 0·46d. per therm cheaper.

It is interesting to investigate the causes which determine the load factor. If the table for street lighting is taken, and the hours from 12 midnight till 6 a.m. are eliminated, a curve plotted follows surprisingly closely the graph for undertaking (A). It would thus appear that the lighting load is chiefly responsible for the fluctuating demand. Street lighting itself, however, only represents 4 p.ct. to 5 p.ct. of the total annual gas output of large towns (above 500,000 inhabitants), and about 10 p.ct. in smaller towns. It therefore cannot be blamed for an unfavourable load factor. It is not suggested that the use of gas for lighting purposes should be discouraged, but it is well to realize how its seasonally fluctuating consumption affects the load factor and thus the selling price of gas. Something can be done to counteract its adverse effects by increasing the gas consumption for other purposes, so as to reduce the proportion of the lighting load in the total gas output. The increase in the use of gas for cooking and heating, not coinciding with the peak load, would flatten-out the load curve. In this respect appliances which can use gas in summer and autumn, and coke in the winter—*i.e.*, during the peak load period—are of considerable value. They also provide an outlet for coke, and enable the undertaking to maintain the all-important balance between gas and coke sales, which determines so largely the cost of production of gas. Successful attempts in this direction



seem to have been made in America and on the Continent, where cooking ranges for the alternative fuels are available, and gas fires are used in conjunction with the almost universal central heating system.

A judicious price policy* would assist in making gas a more attractive proposition as fuel for the above and similar purposes. It is evident that the standing charges, interest, and depreciation on gas produced in plant which is not fully at work throughout the year must be very high; and an attempt has been made to estimate the effect of these charges on the selling price of gas made during the various parts of the year, so as to provide the means for a graded gas price according to seasons. Having regard to the assumptions made concerning average conditions of plant for repair and renewal, all gas sold must bear equally the interest and depreciation charge for the stand-by plant annually required for repair and renewal. The balance of interest and depreciation should then be distributed inversely as the period during which plant is occupied in the year.

It has been shown that the equivalent of 13 p.ct. of the potential gas output has to be provided as stand-by plant for repair and renewal work, when the load factor is 87 p.ct. This figure becomes $13 \times \frac{76}{87} = 11{\cdot}35$ p.ct. for a load factor of 76 p.ct. Since the potential output of example (A) (see chart) is $11 \times 12 = 132$ therms for every 100 therms actually sent out, plant equivalent to $11{\cdot}35 \times \frac{132}{100} = 15$ therms for every 100 therms sent out is to be repaired or renewed annually.

Taking 6 p.ct. for interest and 4 p.ct. for depreciation—*i.e.*, a total of 10 p.ct. on the capital value of works plant and mains—on an average 1·4d. per therm has to be provided; but $\frac{15}{100+15} \times 1{\cdot}4 = 0{\cdot}182$d. per therm, is the charge for repair and renewal plant, borne equally by all the gas sent out, if the balance is divided as outlined above. Gas manufactured in plant used throughout the year would carry $\frac{100(1{\cdot}4-0{\cdot}182)}{11 \times 12} = 0{\cdot}923$d. per therm; that made in plant at work for 11 months per year $\frac{100\,(1{\cdot}4-0{\cdot}182)}{11 \times 12} \times \frac{12}{11}$; and so on. Thus the charge for gas sold in December becomes the true average of the charges borne by the component quantities made in plant occupied during varying periods of the year, represented by the strips *a*, *b*, and *c* . . . on the chart. The computed figure is 1·252d. per therm. In this way the total interest and depreciation figure for gas made in June, which may be regarded as having been manufactured in plant occupied throughout the year, would be 0·182 + 0·923d. = 1·105d. per therm; while the gas sold in December would have to bear a total of 0·182 + 1·252 = 1·434d. per therm; the difference being 0·329d. per therm.

The difference is perhaps not very striking, but it should be realized that no repair and maintenance costs are included. These should also be taken into account, as it is well established that they depend more on the age factor than on the amount of gas made in or passed through the plant. While this argument applies absolutely to mains and gas-works plant other than the retort house, it also holds, in a measure, for the latter. In the writer's experience, carbonizing plant solely used for peak loads and standing idle during the rest of the year has a useful life of only one-fifth of normally employed plant. If the repair and maintenance charges are included, the basic figure of 1·4d. per therm in the above computation is raised to 3·64d. per therm. "June" gas then bears 2·873d. and "December" gas 3·729d. per therm, so that the difference becomes appreciable—viz., 0·856d. per therm.

No attempt has been made to take into account the heavy cost of lighting-up and letting-down plant, which should further increase the difference between gas consumed in June and in December, or, generally speaking, between, say, gas sold between March and September and that consumed during the other months. In the writer's opinion the difference figures obtained above would be even larger in most undertakings, so that there appears ample justification for the adoption of a graduated price scale in accordance with seasonal demands for gas. It is applicable as much to the single as to the multiple tariffs, in which latter case either the consumption or the service charge could be graded.

*These notes were written before Mr. H. C. Smith (Tottenham) read his paper before the Eastern Counties Gas Managers' Association, in which he raised the same point, though approaching the subject from a different angle.

Index to Vol. 186.—As a supplement to this issue is published the Index to Vol. 186 (April to June) of the "JOURNAL."

City and Guilds of London Institute.—There has been published by John Murray, Albemarle Street, W., at the price of 3s. 6d. net (by post 4s.), the programme for the session 1929-30 of the Department of Technology of the City and Guilds of London Institute. Intending candidates will find in it the general regulations and syllabuses for the examinations, and such other information as they may require.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—A special meeting of this Institution will be held in the Gas Offices, Bute Terrace, Cardiff, on July 25, at 2.30 p.m. There will be a discussion on the paper read at the last meeting by Mr. B. J. Bell (see "JOURNAL" for May 22) and the members will visit the new cooker and meter repair shops at the Bute Terrace Works of the Cardiff Gas Light and Coke Company.

Patents Committee, 1929.—The Patents Committee, under the Chairmanship of the Rt. Hon. Sir Charles Sargant, have begun their investigations; and persons and associations who wish to submit suggestions or to give evidence before the Committee are invited to communicate with the Secretary, Mr. R. W. Luce, Industrial Property Department, Board of Trade, 25, Southampton Buildings, W.C. 2. The Committee were appointed by the Board of Trade to report whether any amendments in the Patents and Designs Acts, or changes in the practice of the Patent Office, are desirable.

IMPROVED STREET LIGHTING.

From the Co-Partners' Magazine of the Bournemouth Gas and Water Company.

CENTRAL SUSPENSION SYSTEM IN LOWER PARKSTONE ROAD.

One of the most difficult problems which faces the lighting engineer is that of satisfactory street illumination at night, especially in main thoroughfares which have to carry a large volume of fast motor traffic.

Dazzling headlights are admittedly a danger both to the pedestrian crossing a busy main street and to the oncoming drivers of other vehicles. The intense glare produces complete blindness for a second or two, and it is during that short period of helplessness that accidents happen.

In the interests of public safety, motorists are asked to switch off their head-lights when passing through the well-lighted main streets, or towns, but if they are to do this with real safety, the lighting authorities must provide adequate illumination.

The ideal system would be one which flooded the road surface with an even light of such intensity that any obstacle could be clearly seen at a distance of at least thirty yards in any weather. The actual source of light ought to be concealed, in order to prevent dazzle. The supports ought to create no obstruction to traffic either on the roadway or on the footpaths.

It is obvious at once that the ideal system would be turned down by any lighting committee on the ground of expense; the number of lamps required would be prohibitive. But it is worth while to keep the ideal in mind when planning a new scheme of street lighting in busy thoroughfares, for then every alteration can be made a part of a progressive scheme, and every subsequent addition leads to increased efficiency.

The enormous increase in mechanical road transport during the last five years and the prospect of still further increases in the immediate future have made town surveyors realize that streets which are parts of the main through routes must be cleared as far as possible of all obstructions. It is not merely that the total volume of traffic has grown; the size of the individual unit is constantly increasing. The advent of the covered double decker omnibus has brought problems of its own. Its great advantage over the tram car, with its fixed line of rails in the middle of the road, is its ability to take up and set down passengers at the curb. But the driver of the double decker has to watch every lamp post and every trolley standard if he has to run with his near wheels in the gutter, for the road camber tilts the top of the 'bus outwards to a dangerous degree. Consequently, in all plans for main street widening, provision is made for setting the lamp posts well back from the curb, and for placing trolley posts on the inside of the footpath. Vehicular traffic benefits by these changes, but the pedestrian is hampered.

The double decker has altered the conditions of street lighting. Its top is higher than the ordinary street lamp. Where there are brilliantly lighted shops on both sides of the road, this is of little consequence, but in residential areas its great bulk eclipses the light of the lamp and casts a huge shadow over the roadway.

Central lighting obviates this difficulty, for then all the shadows are cast outwards on the footpaths, where the light is less urgently needed, and the centre of the roadway is unobscured. The old plan of erecting tall lamp standards in the middle of the road has been found to restrict the free movement of traffic, because they make overtaking difficult and dangerous. The pace is set by the slow moving vehicles. The modern tendency is to leave the roadway as free and open as possible, and in consequence the system of suspension lighting has been brought out. A wire stretched from one side of the road to the other carries the lamp at its centre, or a long arm projecting from a post fixed on the footpath serves the same purpose.

An adaptation of this scheme has recently been carried out in the Lower Parkstone Road, Bournemouth. The opportunity arose when the tram track was removed and the overhead trolley wires taken down. The old posts were put to a new use, as will be seen from the photograph. In some cases wires, and in others brackets, carry the lamps centrally over the roadway. The height of the lamps is such as to allow a good clearance for the double decker omnibuses which have taken the place of the trams along this route. Fortunately this was the precise height recommended by the makers for obtaining the greatest possible area of illumination both on the road surface and on the side walks. A certain number of the trolley posts have been put back to the inside of the footpath, and the remainder will be moved gradually as opportunity offers.

Six-light 600 C.P. "Rochester" lamps are used in the scheme. Being fitted with superheaters, they make very efficient use of the gas consumed. The construction is weatherproof under all ordinary conditions, and the costs of maintenance, such as cleaning, mantle and glass replacements, are comparatively low.

Clear glass bowls are fitted, and in consequence the light rays are projected with equal intensity in all directions. The roadway immediately below the lamp is most brilliantly illuminated, as that point is nearest to the source of light. The intensity falls off according to the "law of inverse squares." Special glass bowls are obtainable which reflect the horizontal rays in a downward direction and thus extend the area of well-lighted roadway. At the same time they lessen the glare, and thus come nearer the ideal "concealed source of light." The only drawback is that of added expense.

To ensure good street lighting it is necessary to be able to keep the gas supply to the burner at a constant moderate pressure, and with this end in view special features have been

Here is the Specification of the Fully-Enamelled Cooker

Grey Enamel—Fixed Crownplate, Door Frame, *Exterior Back* and Base.

White Enamel—Front Frame, Latch, Bridges, Cornice, Loose Crownplate, Stand, Door Panel, Exterior Sides and Backplate.

Black Enamel—Inner Crownplate, Hot-plate Bars and Burner Supports.

Taps—STAINLESS Hot-stamped.

Door Handle—Non-conducting Bakelite.

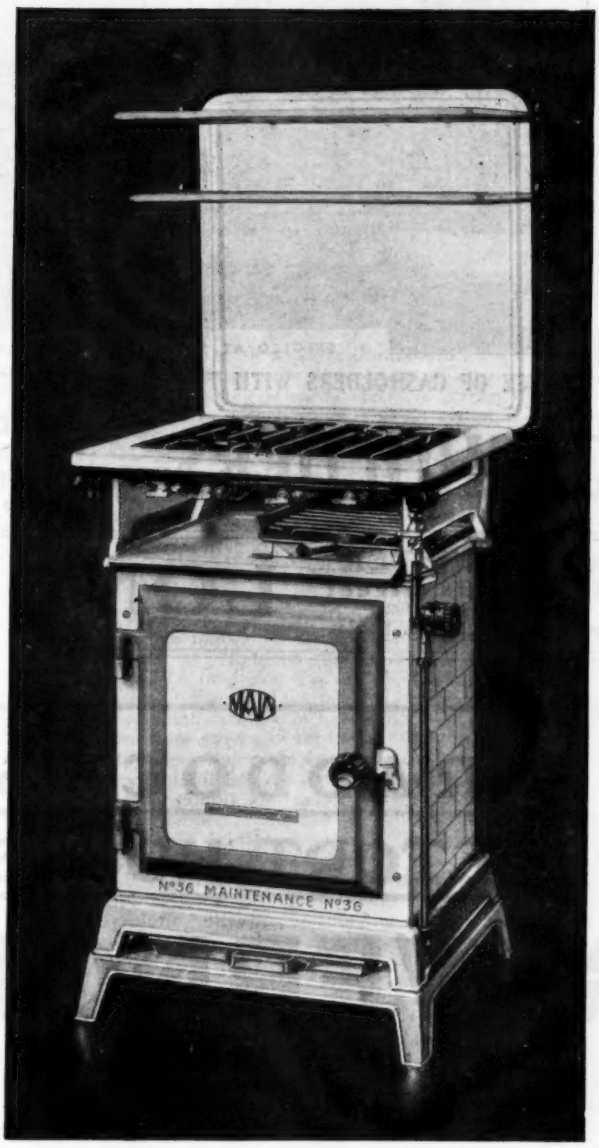
Grill Pan—Grey Enamelled.

Oven Linings and Oven Fittings—Grey Mottle Enamelled.

Plate Rack—Copings Nickel-plated.

The CONSERVOR Oven, because of its two burners, will bake perfectly on the bottom or top shelves. It has a "factor of safety" of about 300%, or with its principal flue completely closed up, its auxiliary flues ensure a "factor of safety" of 100%.

The MAINSTAT Control (available only on Main Cookers) is a precision job with metal-to-metal contact throughout. There are no washers or "packing" to wear and cause leakage. Its construction is such that its *settings remain constant* indefinitely. Therefore prolonged use will not subject it to any drop in temperature from its original adjustment.



Deluxe Mainamel

The one and only Cooker of its class

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ERECTED AT ROME FOR THE ANGLO ROMANO GAS CO.

RANGE OF GASHOLDERS WITH THE CUTLER SYSTEM OF TRIANGULATED GUIDE FRAMING

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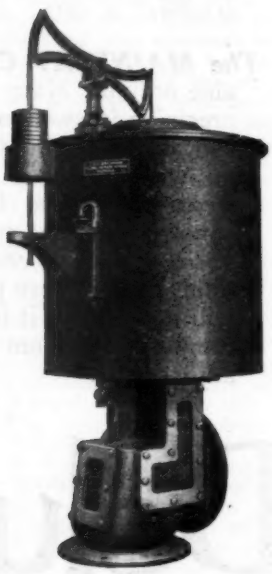
377

BRADDOCK'S RETORT-HOUSE GOVERNORS

HAVE PROVED TO BE
SECOND TO NONE.

Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



No. 310.
Braddock's New Patent Enclosed Retort-House Governor. Latest Type.

Further Particulars upon Application.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, OLDHAM.

Telegrams: "BRADDOCK, OLDHAM." Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E. 1.

Telegrams "METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

incorporated in the governors, which, together with the lamps and controls, were supplied by Messrs. William Sugg & Co., Ltd.

The distance control device can be arranged to light or extinguish any number of units. At present each light is controlled separately.

The best designed street lighting scheme in existence will not maintain itself at full efficiency for long. It needs constant and careful attention at regular intervals; cleaning and adjustment must be provided. The motor tower ladder will be of great service for this purpose, and in case of emergency it can be on the spot in a very short time.

For lighting after midnight, a number of the original Podmore lamps have been retained. A "Gunfire" controller lights these lamps automatically at midnight and extinguishes them at dawn.

LUBRICATION OF GAS ENGINES.

By CLAUD C. BROWN, Gas Administrator, Railroad Commission of the State of California.

From the "Gas Age-Record."

With gas engines, as is true with all other rotative machinery, efficient lubrication is one of the foremost essentials of satisfactory, continuous, efficient, and economical operation. There was a time when this phase of plant operation did not receive the attention that it merits; when almost any cheap lubricating oil was used as long as it passed a few indefinite tests, and after use was discarded.

Of late years, however, there has been keen competition among the oil refining companies in the field of lubricating oil products, and a great deal of research work has been done in an effort to produce products of high quality that are capable of giving real service. Much work has been done along the lines of developing and perfecting lubrication products to fit special conditions of both apparatus and operation. In addition to this, great development has taken place in the design of lubricating mechanisms, with the result that the squirt can, oil cup, and grease cup have been largly replaced by apparatus which produces a continuous, positive and uniform flow of the lubricant to points where it is most needed.

In connection with the question of gas engine lubrication, it is essential that the character of the lubricating oil be such that it possesses sufficient viscosity and oiliness to meet the needs of the mechanical conditions as well as the conditions of temperature, speed and pressure. If this characteristic is not present to a sufficient degree, there will result excessive friction and wear, and, on the other hand, if the oil is too viscous or thick, a loss of power will result. The lubricating system or mechanism installed in connection with the engine must handle and dispense the oil evenly, continuously and regularly.

The oil which is chosen for given conditions should meet the physical and chemical tests necessary to fill those conditions. It should not carbonize, emulsify, or acidify at the temperatures and pressures met with in operation, and it should not produce or throw down deposits when exposed to air, gas, water, dust, or other impurities with which it may come in contact in gas engine operation.

Its qualities and characteristics should be uniform from batch to batch. After a lubricative system has been properly set under constant conditions of operations for an oil of given viscosity, any change in viscosity or other essential properties of the lubricant will upset the balance of the system. If the oil is too thin, the system will feed it too fast, with the consequent wastage of oil, whereas if it is too thick, an insufficient amount of the lubricant will be fed to the engine, which condition will result in overheating and burnouts. The oil chosen should, therefore, be one that is produced by a responsible firm that is known to maintain high standards of quality and to produce a product of uniform quality and characteristics.

Improper lubrication of gas engines invariably results in the formation of deposits on the valves, cylinders, and piston rings of the combustion cylinders. These deposits may be formed by dirt, dust, or other foreign matter from the air, incomplete combustion of the gas engine fuel, inadequate or insufficient cooling effect of the cooling water system, or the use of an excessive quantity of low-grade lubricating oil which contains an excessive amount of impurities, or which has an excessively high carbon or asphalt content.

In the case of power cylinder lubrication, the problem is to select an oil most suitable for the type of engine at hand, its mechanical condition, the load factor under which it is operated and the operating characteristics of its cooling water system. In the operation of a two-cycle engine, each revolution is a working stroke, whereas in the case of a four-cycle engine, every other revolution is a working stroke. Hence, the rate of heat transfer from the interior cylinder walls to the cooling water must be twice as rapid in a two-cycle engine as in one which operates at four cycles, in order to maintain the same temperature in pistons, rings, and internal cylinder wall surface. The dissipation of heat from the combustion cylinder of a gas engine may be greatly retarded if cooling water scale is allowed to form in the cylinder jackets, due to the use of hard untreated water or the absence of a water treating plant for treatment of the cooling water. Any of the above conditions that tend to produce excessive temperatures make necessary the use of heavier cylinder oil. In addition to this, if the cylinders, pistons, or rings are excessively worn, a heavier oil must be used to create an adequate seal and to assist in cushioning the resultant piston slap.

In some types of two-cycle engines, water in the form of vapour is injected with the fuel charge for the purposes of retarding the rate of combustion of the fuel, minimizing the detonating effect of the explosion, and securing a steam expansion effect. Where this practice is carried out, improved lubrication will result by using a good cylinder oil compounded with about 5 p.ct. of acidless tallow.

The oil chosen for power cylinder lubrication should be the lightest bodied oil which will maintain a constant and adequate lubricating film under a given set of operating conditions. If too heavy an oil is used, excessive carbon deposits will occur under valves, piston rings, and on piston and cylinder heads, and excessive temperatures will result.

Mechanical forced-feed lubrication only should be used for power and compressor cylinders. In the case of new engines, or of engines that are kept up in good condition and properly cooled, a good quality paraffin base oil of 300 to 500 seconds viscosity or a good asphalt base oil of 500 to 550 seconds viscosity, properly fed to each cylinder at the rate of five to ten drops of oil per minute per cylinder, will ordinarily produce sufficient and adequate lubrication for gas engine power cylinders.

In the matter of crank case and bearing lubrication, the lightest oil that will maintain the proper lubricating film should be used, for the use of oils having excessive viscosity means increased fluid friction, which in turn means loss of power, and increase in heat generation. The friction losses of a medium sized gas engine will run from 15 to 30 p.ct. of its rated capacity, while in the case of large units this loss will vary from 10 to 20 p.ct. of rated capacity, even when properly and adequately lubricated.

The proper crank case oil level should be definitely determined and rigidly maintained. Too much oil in the crank case will mean increased friction and a shortening of the life of the oil. Too little will result in burned out bearings. Heavy duty gas engine crank cases should be equipped with continuous circulating filtration and cooling systems, wherein all of the oil, or a portion thereof, is continuously circulated, purified and cooled.

From the foregoing, it is evident that in the proper lubrication of gas engines, the selection of the proper lubricants, and the proper design, installation and operation of lubricating devices are matters of paramount importance. In the matter of the selection of a lubricating oil, the customary routine tests to determine flash, fire, viscosity, &c., are not sufficient. The characteristic of viscosity is in a certain way a measure of the lubricating value of an oil. Oils which show the same viscosity at a given temperature, however, but are made from different crude oils, may differ widely in lubricating value and efficiency in the same engine, so that other tests are necessary definitely to classify an oil to local and individual operating conditions such as carbon tests, volatility, heat test, acidity, emulsion test, &c.

Polychromatic Homes.—Dr. Gustav Egloff and Dr. J. C. Morrell, two Chicago Engineers, have become depressed with the monotony of building materials used for towns and cities, and they advocate bright streets composed of materials of different hues. In a paper on this subject before the Second International Conference on Bituminous Coal, held in Pittsburgh, they advocated the adoption of furnace ashes as the base for building materials, with hexatetramethylamine as colouring matter. To obtain the latter, formaldehyde and ammonia are added to carbolic acid. The addition of iron oxide results in a red product, titanium oxide produces a blue colour, and other dyes may be added, singly or in combination, to obtain any desired colour effect. The material is impervious to water, highly resistant to atmospheric corrosion, and can be produced cheaper than the granite now employed to veneer steel buildings. Here, then, is another use for coal.

SOME EFFECTS OF TEMPERATURE ON COMMERCIAL HEAT-INSULATING BRICKS.

By A. J. DALE and F. WHEELER.

From the 1929 Report of the Refractory Materials Joint Committee of the Institution of Gas Engineers and the Society of British Gas Industries.

In a report submitted to the Institution in 1928, the present state of practice of insulating carbonizing plant was considered and two difficulties connected with the practical application of insulating brickwork were specially emphasized. These were:

(*a*) The low mechanical strength of most types of insulating bricks.

(*b*) The shrinkage tendency of insulating material at high or moderately high temperatures.

Difficulty (*a*) concerns and may adversely affect the mechanical stability of an insulated structure, unless some special method of bonding the brickwork is employed. As regards (*b*) shrinkage of the built-in insulation may not only weaken the structure as a whole, but as a result of an opening of the joints, increased thermal loss by radiation and convection may exceed the saving which is expected from the low conductivity of the insulating blanket itself.

For this reason it seems desirable to obtain definite information on both the above points, and this section of the report accordingly sets out, in abstract, the more important data gathered from a laboratory investigation of a wide variety of commercially-available insulating materials.

Types of Material Investigated.—Representative samples of the following varieties of insulating products were included in this work. (*a*) Bricks cut from naturally occurring diatomaceous deposits. (*b*) Bricks made from diatomaceous earths which contain sufficient clay, &c., for moulding purposes. Cork, &c., may or may not be added. (*c*) Bricks made from a diatomaceous deposit, to which clay has been artificially added. (*d*) Bricks made from lightly-burned mixtures of a fireclay with cork, sawdust, or slack.

Table I. is a schedule showing the laboratory numbers attached to the various samples, and includes also thermal conductivity and porosity and cold crushing data where this is available.

TABLE I.

Lab. No.	Description of Material.	True. Per Cent. Porosity.	Cold Crushing. Lbs. per Sq. In.
A 1	Cut from solid diatomaceous deposit	77·0	440
A 2	As above, but calcined	77·2	645
B 1	Moulded from diatomaceous deposit	72·6	614
B 2	As above, with cork additions	75·7	401
C 1	Calcined diatomaceous earth, clay bonded	66·1	..
C 2	Diatomaceous earth, clay bonded	77·3	187
D 1	Presumably clay and sawdust	68·1	..
D 2	Clay and slack	47·4	511
D 3	Presumably clay and sawdust	62·4	429
Super	Composition not definitely known	71·7	426

Behaviour under Low Load at High Temperatures.—Selected samples of the various commercial products have been submitted to two series of high temperature load tests. The first type of test followed the normal modified Mellor and Moore load test procedure, the test pieces being subjected to a static load of 4 lbs. per sq. in. and heated at the rate of 50° C. per five minutes until complete failure had occurred.

The significant temperatures of these test results are collected in Table II. In this table the figures in the columns headed (a), (b), and (c) refer respectively to temperature at which subsidence commences; the temperature at which subsidence accelerates; and the temperature at which the test piece, originally 3½ in. long, has subsided to the extent of half an inch.

TABLE II.

Brick No.	(a).	(b).	(c).
	° C.	° C.	° C.
A 1	900	1100	1270
A 2	1120	1200	1420
B 1	1050	1120	1230
B 2	1030	1080	1210
C 1	1170	1220	1450
C 2	1000	1070	1420
D 1	1400	1460	1520
D 2	1350	1450	1540
D 3	1300	1400	1500
Super	1300	1500	1580

In the case of bricks A1 and A2 which have a definitely laminated structure, the tests were performed with the load perpendicular to the plane of the laminations. Referring to those bricks which are known definitely to have a diatomaceous earth basis, it will be seen that under this low load the temperature at which subsidence commences may vary between 900° and 1170° C., according to the nature of the material. Further, a pre-firing of the diatomite raises the temperature at which yielding begins.

It was thought desirable to have additional information as to what would happen if those materials, under a load of 4 lbs. per sq. in. were maintained at a temperature just at or above that at which subsidence begins.

For this reason the second series of tests refer to the behaviour of the samples at the temperatures shown in Table III. This table shows the constant temperatures at which the specimens were tested, together with the scale-subsidence in $\frac{1}{10}$th inch. Since the scale magnification is 16 to 1, actual subsidences on a test-piece 3½ in. long can be calculated from these figures.

TABLE III.

Brick No.	Testing Temperature.	Scale Subsidence in $\frac{1}{10}$ Inch.
	° C.	
A 1	..	..
A 2	1150	25
B 1	1000	16
B 2	950	0
C 1	1050	4
	1150	29
C 2	950	0
D 1	1300	0
	1350	3
D 2	..	..
D 3	..	..
Super	1400	14

With reference to the figures included in the previous table, it should be realized that in some cases the subsidences are by no means complete at the end of the two-hour treatment at constant temperature. On this account, Fig. I., which refers to Brick C1, is shown. In the test at 1150° C., subsidence is still proceeding rapidly, even at the end of the two-hour period.

After-Contraction Data.—The linear shrinkages (under zero load) of the experimental materials were determined after repeated heatings at 900° and 1000° C. The first heating was effected for a two-hour period at 900° C. The test-pieces were then cooled and measured. They were then reheated for a similar time at 1000° C., and after being cooled and measured were again reheated for two hours at 1000° C. The "after-contraction" data, calculated as accumulative percentage linear contractions, are shown in Table IV.

Conclusion.—The practical application of the results recorded in this report may be summed as follows: Before applying any type of heat insulation within the bound-

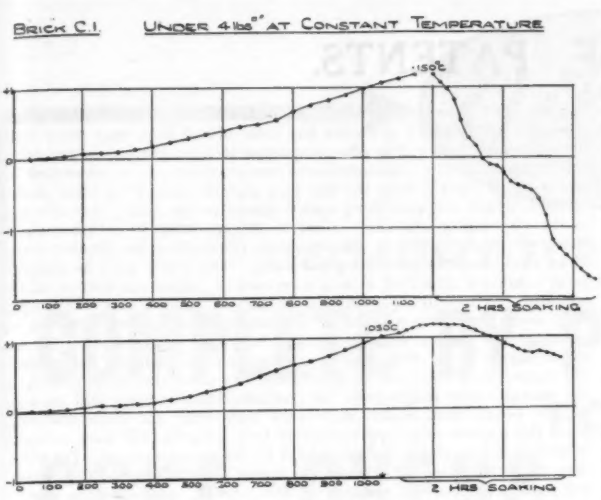


Fig. 1.

TABLE IV.

Brick No.	2 Hrs. 900° C.	2 Hrs. 1000° C.	4 Hrs. 1000° C.
	Per Cent.	Per Cent.	Per Cent.
A 1	1·86	2·73	6·65
A 2	0 22	4·53	5·40
B 1	2·59	5·37	6·78
B 2	1·57	9·23	11·95
C 1	0·34	0·80	2·22
C 2	0·98	3·25	3·47
D 1	0·07	0·10	0·20
D 2	0·00	0·00	0·00
D 3	0 03	0·05	0·18
Super, plus	0·17	0 10	0·12

ing walls of a high-temperature structure, it is extremely desirable to know the probable temperature distribution through the wall. The insulating blanket can then be placed at a position which contraction test, or low-load test data, indicates as being suitable for the material itself. Satisfactory compromise between thermal economy and structural stability should be possible as the result of laboratory testing.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Performance Labels for Gas Appliances.

SIR,—The mass production lines upon which appliances are now manufactured and supplied to the industry seem to call for some form of "inspection and test guarantee" on the part of the makers. It is well known, of course, that practically the whole of the manufacturers who enjoy the patronage of the gas industry do pay very considerable attention to proper superintendence in manufacture, but the absence of such evidence on the finished article when delivered to the undertaking is, in the mind of the writer, no proof that it is ready for immediate delivery and installation on the premises of the consumer.

The facilities available to many of the smaller undertakings for any form of test of apparatus previously to delivery to premises are few, and adjustment has to be left to the fitter, who may possibly pass over any small defect in either construction or finish—to be found out later by the consumer.

One is, of course, aware that calorific values and pressures differ throughout the country, and that some slight adjustment of burners is usually found necessary; but I believe that manufacturers can form a very useful and appreciated service by attaching to each piece of apparatus a label detailing the examination and test carried out by their works. Such information could be confined to test taken at (say) two different pressures, representing approximately the minimum and maximum likely to be met, a note as to the calorific value of the gas under which the test is taken, and examination of parts and finish, these details being confirmed either by the signature or the initials of the examiner.

In the sale to the public of many articles of popular interest, such as wireless components and even confectionery, a guarantee ticket will often be found, implying a desire to increase the satisfaction of the public with the article in question; and though possibly the supply of gas-consuming apparatus is service of a somewhat different character, yet the purchaser (in this case the gas industry) would have an added and very desirable assurance. The cost of carrying out the idea would be very small compared with the satisfaction it would, I feel sure, produce.

I am, of course, aware that some time ago certain firms attached a "Hall Mark" label to their appliances, but this has apparently been discarded; in any event such practice does not meet the point I now raise. The aim of the progressive gas undertaking is to supply gas of constant calorific value and density, at a pressure shown by a straight line on a chart, as thereby apparatus is likely to function satisfactorily until the time for cleaning and maintenance comes along. The first two factors are becoming established, but the latter—namely, equable pressure over the 24 hours—is a more difficult matter. It would seem, therefore, that the provision of a suitable governing device is very desirable, particularly on appliances which are in almost constant daily use, such as cookers, fires, and geysers; and while one cannot expect the industry to provide consumers with an apparatus of this kind without cost, it does seem necessary that the gas salesman and showroom attendant should advocate the installation of a suitable governor when carrying through the transaction. The undertaking would lose nothing by supplying it at cost price.

A good deal of experience has been had with governors connected to domestic gas consuming appliances, these giving satisfactory service. In any event it does seem necessary to instal some such controlling device, particularly with cookers where the oven temperature is thermostatically controlled.

SAMUEL B. CHANDLER, A.M.I.Mech.E.

Milton Cottage,
Bound's Green Road, N. 22,
July 13, 1929.

Good Working at Hamilton.—The annual report of Mr. David Robb, the Manager of the Hamilton gas undertaking, which is municipally owned and controlled, shows a net profit of over £3300. The price will be reduced by 2½d. per 1000 c.ft., making the rate 2s. 3½d., or 6·25d. per therm. In addition to the reduction mentioned, £1000 from the profits of the undertaking has been transferred to the Common Good revenue account, and a balance of fully £4068 has been carried forward to next year.

Carbonising Holdings was registered as a public Company on July 13, with a nominal capital of £200,000 (80,000 "A" of £1 and 1,200,000 "B" of 2s.), to adopt an agreement with the Société Hatfi Société Anonyme to carry on the business of distillers, manufacturers, and suppliers of all solid, liquid, and gaseous substances or matter derived from coal and other carbonaceous materials, ironmasters, metallurgists, distillers, &c. Registered office: 428, Salisbury House, London Wall, E.C. 2.

Gas at the Royal Lancs. Agricultural Show.—The Blackburn Corporation Gas Committee have been responsible for an ambitious scheme in providing the Royal Lancashire Agricultural Show with gas for cooking purposes. The event is limited to a few days, but it will be of gigantic proportions, and the consumption of gas will be on a very extensive scale. Mains have been connected with the Corporation service pipes, and the Show will be the first where the whole of the cooking has been done by gas, which will be connected to a great variety of stands and departments on the 56-acre plot.

Wonder Washer Company has been registered with a nominal capital of £6000 as manufacturers of machines for washing, wringing, and mangling. The offices are at 68, Victoria Street, Westminster, S.W. 1.

The Year's Results at Walsall.—In presenting the accounts of the gas undertaking to a meeting of the Walsall Town Council on July 8, Mr. J. A. Leckie (the Chairman) said the Department suffered considerably through the severe weather of last winter which played havoc with the gas mains. The total income was £180,387, as compared with £181,494 in the previous year. The small decrease was more than accounted for by a reduction in price which took place at the beginning of the year. Of the income, £135,327 came from sales of gas, and £35,837 from sales of residuals. On the expenditure side, the total was £134,791, as against £133,689. The net profit was £10,331, against £14,218; but Mr. Leckie mentioned that the difference was more than accounted for by the fact that whereas last year payments for income-tax were made out of the reserve fund, this year they were met out of revenue. But for that the available balance for appropriation would have been £17,170. Mr. Leckie added that it was very unsatisfactory that the undertaking had a debit on the reserve fund of £19,832. He attributed this to the fact that the Committee had been altogether too generous in their contributions in relief of rates, and said they would have to call a halt so that the undertaking might have time to recover. Replying to comments, Mr. Leckie said he admitted that the past year's results had not equalled anticipations, but the financial position of the undertaking was thoroughly satisfactory.

REGISTER OF PATENTS.

Coke Quenching Apparatus.—No. 313,020.

ROBERT DEMPSTER & SONS, LTD., and HANDLEY, W. H., both of Elland.

No. 3392; Feb. 3, 1928.

This invention relates to apparatus for handling and quenching coke, and to that type of apparatus in which separate charges are conveyed to a small quenching bench by a travelling telpher skip, so that while the coke is being quenched the skip may be on its return journey, to receive the next charge. The chief object is to introduce an improved form of apparatus of this type which, while maintaining the simple and expeditious handling achieved by this method, will result in the production of dry coke, prevent the quenching water from getting into a receiving hopper, or chute, and also prevent any coke and the greater part of the breeze from passing forward with the surplus quenching water drained from the bench into a settling tank.

According to this invention a small quenching bench permanently mounted at an incline in a framework is provided with one or more gates so that coke deposited on to it from the telpher skip will travel down the incline when the gates are opened; the quenching operations being performed prior to the opening of the gates, and controlled by an operator other than the telpher driver. The capacity of the small quenching bench is approximately equivalent to that of the skip. No quenching water or steam can get on to the motor or other gear for opening and closing the gates, and the control for the gear, together with the quenching control and the means for preventing water from getting into the hopper, and coke or breeze from passing into the settling tank, are advantageously arranged at one point within suitable reach of the operator from the floor level.

Fig. 1 is a front elevation of apparatus for handling and quenching coke in accordance with this invention; and fig. 2 is a side elevation.

FIG. 1.

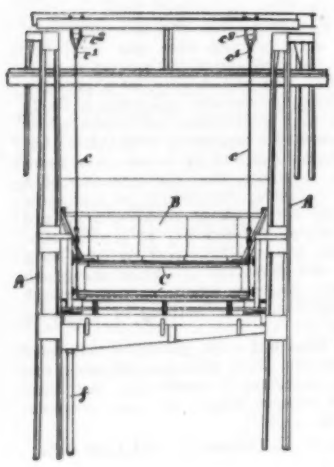
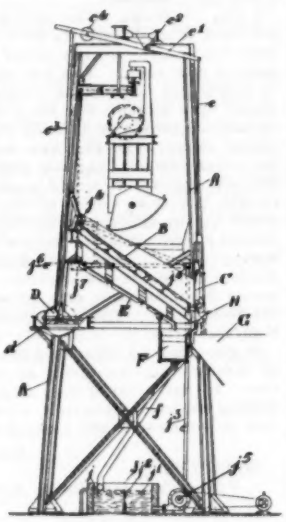


FIG. 2.



Dempster and Handley's Coke Quenching System.

A indicates a framework in which is permanently mounted at an incline a small quenching bench B provided at its lower end with a gate C which can be raised and lowered by means of a motor D. For this purpose the gate may be connected at each end by flexible connections c to arms c^1 which are pivoted intermediately at c^2 and are connected at their other ends by links c^3 to cranks d on the motor shaft or some part appertaining to the motor drive. Counterbalance weights c^4 may be mounted on the pivoted arm c^1 to balance the weight of the gate. When a motor is used, it may be cut off automatically at each end of the movement of the gate by limit switches. The motor is conveniently carried by the aforesaid framework A. The quenching bench B may be perforated or otherwise, and when perforated it is provided with a false bottom E which overhangs into a trough F provided to receive the surplus quenching water. A device for preventing quenching water from passing into a hopper G or chute that may be carried by the framework comprises a flap H adapted to be moved to either of two positions by the operator. When the quenching operation is being performed the gate C is closed, and the flap is moved into a position in which it will divert quenching water that is passed through the coke into the trough. The flap is shown in this position in fig. 2. When the quenching operation has been completed the flap is moved from that position to one in which it will form a continuation of the quenching bench B and project into the hopper G so that when the gate C is opened the quenched coke will travel down the bench by gravity, and over the extension formed by the flap, directly into the hopper G; and none of the coke will pass into the trough. The latter is connected by a pipe f with a settling tank J which may comprise two compartments j j^1 separated by a gauze or other filtering partition j^2 which prevents any coke breeze that may enter with the quenching water into one compartment from getting to the other compartment. The last-mentioned compartment j^1 is connected by one or more pipes j^3 with the spraying pipe or pipes j^4 or other device through which the quenching water passes to the coke; and situated in the circulating system is a motor driven pump j^5 or other circulating device, actuated by the operator, for causing the filtered water to be circulated for quenching purposes. The water may be supplied from a main j^6 provided with a stop cock j^7 under the control of the operator. After the quenched coke has descended into the hopper G it may pass into wagons or be taken by a bucket conveyor or elevator into screens feeding storage hoppers. By providing for the water supply to be controlled by an independent operator for quenching purposes in the manner described, dry coke can be obtained, as the operator can judge from the position that the coke will take up on the bench (and which may vary somewhat for each discharge from the telpher skip) approximately how long he will have to spray it with water to retain sufficient heat in the coke to dry it. He would then turn the water off or stop the motor appertaining to the circulating pump, reverse the position of the flap H, and open the gate C to allow the quenched and dried coke to slide into the receiving hopper.

Operating Vertical Retort Doors.—No. 313,021.

ILLINGWORTH, S. R., of Pontypridd, and the ILLINGWORTH CARBONIZATION COMPANY, LTD., of Manchester.

No. 6387; Feb. 29, 1928.

This invention relates to improvements in manually operated vertical retort doors. The door is preferably of that type which is adjustably and/or detachably carried by two or more arms pivotally mounted on a shaft forming the hinge point of the door, to enable the latter to be readily renewed and maintained in gas-tight contact with its seating by proper adjustment. The door is operated by a link directly connected at one end to a lever on a shaft forming the hinge point and on which the door is fast, and at its other end to a lever on the operating shaft, and on which, for hand operation, an operating handle is provided. The pivotal points of connection of the link are arranged to move into dead-centre position with respect to the operating shaft when the door is opened and closed. The points are arranged to lie in a vertical line passing through the axis of the operating shaft when the door is closed. The door is adjustably carried on arms fast on the shaft forming the hinge point; and to facilitate the operation of the door by hand, a counterweight is provided for balancing the weight of the door system about its hinge point—the counterweight being mounted on the lever on the hinge shaft to which the link is connected.

Furnace Grates.—No. 313,380.

WILTON, T. O., and the CHEMICAL ENGINEERING AND WILTON'S PATENT FURNACE COMPANY, LTD., both of Victoria Street, S.W. 1.

No. 26,907; Sept. 19, 1928.

This invention relates to furnace grates designed to enable an almost complete combustion to be obtained with a very low consumption of steam for producing the blast. It is known to provide at the back end of the furnace grate a chamber or chambers at the rear of the grate having an upwardly inclined top provided with vents, one row of the vents being disposed in the vicinity of the furnace bridge, adapted to direct the blast transversely of the draught carrying off the products of combustion so as to cause a whirling motion of the furnace gases. Such furnaces have frequently to be designed for fitting inside boiler flues, the exact diameter of which is not known beforehand. They have also often to be fitted inside boiler flues or furnace spaces of various diameters or dimensions, so that a great many different sizes of parts have to be kept in stock. According to the present invention, in order to obviate these disadvantages, the plates constituting the inclined top are provided with lateral adjustable extension pieces or side strips which can be made to overlap more or less the plates, thereby modifying the breadth of the inclined top, according to the requirements of the available space.

Supply of Gas-Air Mixtures to Burners. No. 313,059.

DOCKING, A., of Belfast, and PREMIX GAS PLANTS, LTD., of Westminster.

No. 3543; Feb. 4, 1928.

This invention relates to the supply of gas to furnaces and industrial appliances generally, its object being to provide means for effective mixing of the gas and air. The difference in the density of the two gases—namely, air at 1 and gas at 0·5—makes it impossible for them to diffuse in the limited space between the usual supply nipple and the burner nozzle; and imperfect combustion results. Stratification, state the patentees, cannot be avoided in the present high-pressure, or low-pressure, or separate air and gas, or low-pressure gas and air-blast systems. The stratification results in gas passing through the combustion nozzles unburnt and the combustion

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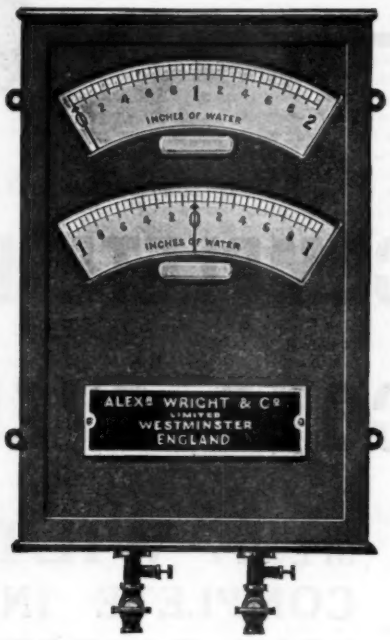

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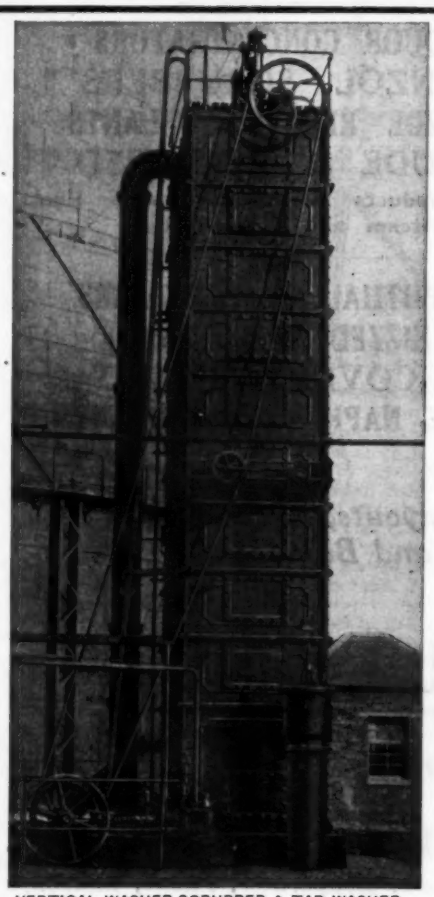
1, Westminster Palace Gardens, Victoria Street, WESTMINSTER, S.W.1

'Phone: Victoria 1207. T.A.: "Precision, Sowest, London."



VERTICAL WASHER-SCRUBBER & TAR WASHER.

THE WALKER
VERTICAL AND HORIZONTAL
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POSSESS DISTINCT ADVANTAGES

THE VERTICAL TYPE.

ELIMINATES AMMONIA & MOST OF THE CO_2 & H_2S.

HAS LARGE SCRUBBING SURFACE.

A TAR WASHER CAN BE FITTED IN BASE IF REQUIRED.

EXTRACT FROM A TESTIMONIAL JULY **1926.**

"YOUR VERTICAL WASHER-SCRUBBER GIVES GREATER SATISFACTION THAN MY HORIZONTAL WASHER-SCRUBBER. STEAM IS REQUIRED IN THE HORIZONTAL MACHINE OR IT BECOMES BLOCKED UP, WHEREAS YOURS NEVER DOES."

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DONNINGTON, near WELLINGTON — SHROPSHIRE.

LONDON OFFICE: 70, VICTORIA STREET, WESTMINSTER, S.W.1.

in such cases generally takes place in the flues; or the unburnt gases escape to the outer atmosphere.

The patentees supply air and gas through suitable control means to a common nozzle, or injector, in communication, either directly or indirectly, with a compressor wherein the air and gas are effectively churned and mixed together before being passed to the outlet, from which the mixture passes to the burner, or burners. Before passing out to the burner, or burners, the gas and air mixture preferably passes through a suitable back-fire trap of gauze, and also preferably through a nozzle, or nipple, designed to limit the outlet of mixture in accordance with the maximum admission of air and gas to the compressor, whereby the volume of the gases in the compressor is balanced.

In carrying out the invention, the patentees provide a gas nozzle, controlled by a cock or valve, having a definite sized hole, or a number of holes, communicating directly with a chamber into which air is admitted through a controlled inlet, or inlets. The injector, into which the gas and air are admitted, is preferably so made that the incoming air and gas are directed into a common passage communicating directly with a rotary compressor in which the gas and air are thoroughly mixed before passing to the outlet.

Such a gas and air mixing device is particularly suitable for many industrial purposes—for example, for supplying an efficient mixture of gas and air to the burners of calenders, where there is no possibility of providing a secondary air supply and where proper mixture of the gas and air is essential to efficient and economical operation.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 3.]

Nos. 19,267—20,074.

GAS LIGHT AND COKE COMPANY.—"Separation of volatile substances from liquids." No. 19,371.

GAS LIGHT AND COKE COMPANY.—"Refrigerating systems." No. 19,509.

GAS LIGHT AND COKE COMPANY.—"Treatment of fluids with solid adsorbent." No. 19,510.

HORNER, H. B.—"Domestic appliances heated by oil or gas burners." No. 19,703.

JOHNSON, J. Y. (I. G. FARBENINDUSTRIE AKT.-GES.).—"Manufacture of low-temperature carbonization tar." No. 19,384.

MASTERMAN, C. A.—See Gas Light and Coke Company. No. 19,509.

PRESTAGE, E.—"High-pressure gas compressors." No. 19,824.

LEGAL INTELLIGENCE.

EXTENSION OF PATENT.

Application of the Clyde Furnace Company Refused.

In the Chancery Division before Mr. Justice LUXMOORE, the Clyde Furnace Company, Ltd., of St. Vincent Square, Glasgow, applied for an extension of their letters patent covering an invention by Mr. Thomas Rogerson enabling regenerative open hearth furnaces to be repaired without letting out the fires.

It was stated by Counsel for the applicants that the invention was of considerable value in gas-works and in the steel industry, and the Company was formed to exploit it. Its object was to renew air or gas force by which air or gas was admitted to the furnace. The patent expired in May last, and the application was based on lack of opportunity to exploit the invention because of the war. The invention, it was said, was of much merit and was a success from the start, but the war prevented steel and gas companies from testing and adopting it.

The application was opposed on the ground that the loss of the patent was not due to the war, but to the fact that applicants were unable to convince users of the advantage of the invention.

His Lordship refused the application.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF LORDS.

The following Gas Orders stand referred to the Special Orders Committee, but no date for their consideration has yet been fixed: Andover, Cleveland, Stockport, Weymouth, Boston, Dudley, Wateringbury, and Alton.

HOUSE OF COMMONS.

The Second Reading of the Romford Gas Bill, suspended from last session, was taken on Tuesday, July 16.

MISCELLANEOUS NEWS.

PRIMITIVA GAS SHARES.

Holding Company's Exchange.

The following announcement appeared recently in the "Financial Times" in regard to the shareholdings of the Primitiva Gas Company of Buenos Aires:

Primitiva Holdings, which has been formed to take over the shares of the Primitiva Gas Company of Buenos Aires, will invite holders of shares in the latter Company to make the exchange towards the end of this week [week ended July 6].

The new Company's capital is £3,000,000 in £1 shares, and 2,339,644 shares will be issued in exchange for a similar number in Primitiva Gas.

It was originally proposed that the capital of the Holding Company should be in £5 units, and that after the exchange was complete they would be split into 60 p.ct. 5 p.ct. preference stock and 40 p.ct. ordinary stock, but owing to the complications that would arise in dealing with fractions of stock, the capital, as stated above, is in £1 shares, which enables a £1 for £1 exchange and simplifies matters considerably.

As already mentioned in the "JOURNAL" for July 3, p. 42, the "C.H.A.D.E." (Compania Hispano Americana de Electricidad S.A.) has bought 660,000 unissued shares of the Primitiva Gas Company at 30s. each.

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The Gas Referees' reports of the official testings for the past quarter give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Commercial Gas Company.—503 B.Th.U. (declared calorific value, 500 B.Th.U.).

Gas Light and Coke Company.—502·1 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—562·1 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—503·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Tottenham and District Gas Company.—501·9 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—471·4 B.Th.U. (declared calorific value, 470 B.Th.U.).

LOW-TEMPERATURE CARBONIZATION IN KENT.

Bulk Gas Supply from Tilmanstone.

At the opening of the second annual fête and sports of the Tilmanstone Colliery (Kent) held at Elvington Court on July 6, Mr. Tilden Smith, the owner of the colliery, made proposals of the greatest importance in regard to gas undertakings in East Kent.

Arrangements are practically completed, he said, for the treatment of an appreciable portion of the output of the Tilmanstone Colliery by a process of low-temperature carbonization. Its principal products will be domestic fuel and gas. The domestic fuel will be in the form of semi-coke, and the market for it is already at hand, not only in the towns and villages of Kent, but among the seven or eight millions people who live in the metropolis of the Empire. The comparatively small quantities of semi-coke which have reached the consumer under its various trade names have been very well received. Its heating qualities are as good as, or better than, the best household coal. It is clean to handle, practically smokeless, and seems to store well, making very little small in the cellar. To be economical, however, the low-temperature plant must have a sure market for its gas, and I have endeavoured to secure this by the acquisition of a controlling interest in the East Kent Gas Company, with their rights to supply gas over an area of about 200 sq. miles. Other gas companies in Kent are also being acquired, and together they will provide an outlet for the whole of the gas from the first economic unit of the low-temperature plant. The scheme is to supply these companies with gas in bulk from the low-temperature plant at Tilmanstone for distribution by them within the areas under their jurisdiction.

Abertillery Gas Department Results.—The gross profit on the Abertillery Gas Department for the year ended March 31 last amounted to £4000, and the net profit to £757. The total make of gas during the year under review was 82,229,000 c.ft.

Coke Oven Plant at Billingham.—A visit was recently paid by members of the Northern and Midland Sections of the Coke Oven Managers' Association to the new Simon-Carves coke oven plant at the Billingham works of Synthetic Ammonia and Nitrates, Ltd. The present plant consists of 64 ovens designed to produce 1000 tons of coke per day, on a site which allows the doubling of the capacity in the future. The ovens are in two batteries, one of 30 and one of 34; the first battery is now being heated up and the second is under construction. The plant includes complete bye-product recovery equipment.

CO-PARTNERSHIP AND PROFIT-SHARING IN BRITISH GAS COMPANIES.

Particulars at Dec. 31, 1928.

[From the June Issue of "Co-Partnership."]

Name of Company.	No. of Years Scheme has been in Operation.	Capital in 1928. Total Share and Loan.	No. of Employees under Agreement for Profit-Sharing or Co-Partnership.	Amount Divided Among Employees for Year ended Dec., 1928.	Amount P.Ct. on Wages.	Total Profit to Employees since Scheme was Adopted.	Amount of Shares and Deposits held by Employees at Market Value on Dec. 31, 1928.
		£		£		£	£
S. Metropolitan . *a*	39	9,739,340	8,500	82,624	5	1,245,644	914,900
S. Suburban. . *a*	35	2,180,769	1,679	14,496	5	161,457	161,798
Commercial . . *a b*	28	2,548,280	1,444	20,732	12·8	209,938	142,612
Chester	28	223,304	141	1,416	6·5	13,873	7,800
Bournemouth . .	21	1,700,201	691	10,093	8·7	90,213	46,956
Tottenham . . .	21	2,492,293	1,298	10,836	6·5	107,444	53,766
Rugby.	21	107,004	92	556	3·5	4,124	..
Tunbridge Wells *c*	21	205,266	162	1,117	4·7	13,504	8,216
Gloucester . . *d*	20	320,845	219	1,234	4	15,892	12,612
Wellingborough *d*	20	112,015	107	1,242	7·5	9,824	14,791
Croydon . . . *c*	20	1,689,061	949	11,907	7	102,659	25,099
Weston-super-Mare	20	241,330	189	1,387	5·2	9,522	3,218
Gas Light and Coke	20	36,991,165	15,697	87,155	5	937,170	728,275
Grantham . . .	19	121,068	51	182	2·2	4,634	1,353
Cambridge . . *d*	19	309,628	235	3,392	8·2	16,134	10,875
Cardiff	19	1,064,650	602	6,682	6·5	57,396	21,990
Watford	19	357,080	218	1,318	3	15,632	13,206
Wandsworth . *b*	18	1,956,059	1,389	23,421	14·7	157,322	99,958
Liverpool. . . *b*	18	3,467,640	2,285	12,161	5·6	121,576	106,077
Bridgewater . . .	18	89,684	39	542	8·6	7,379	3,008
Hertford . . . *d*	17	25,609	40	155	3	1,605	1,291
Aldershot . . *d*	17	1,206,367	203	2,153	6·8	20,499	12,278
Ipswich . . . *c*	16	398,538	252	2,534	6·2	18,955	17,991
Canterbury . . .	16	211,710	106	841	5	7,960	5,505
Newmarket . . .	16	162	4	81	7	878	790
Swansea	16	844,813	248	2,250	5	12,436	4,442
East Surrey . . *d*	15	394,218	168	1,326	5·5	9,213	8,302
Shrewsbury . . *d*	15	185,849	147	957	5	7,543	4,342
Eastbourne . . *c*	15	375,410	243	2,991	6·4	21,357	19,765
N. Middlesex . *e*	9	382,944	207	2,049	..	14,629	15,685
Brighton . . . *e*	8	1,282,066	819	7,709	..	58,647	65,045
Southend. . . *d*	7	626,184	413	4,099	6·2	18,342	5,950
Lea Bridge . . *e*	7	420,863	256	2,606	..	16,767	19,097
Broadstairs . . *c*	7	111,537	52	325	..	2,090	2,866
Bishop's Stortford *e*	7	169,273	101	542	..	3,547	3,883
Cromer . . . *e*	7	52,322	16	144	..	755	1,380
Harrogate . . .	7	359,752	208	1,772	6	11,427	8,569
Sevenoaks . . .	7	71,165	72	470	4·6	2,707	2,606
Waltham . . *g*	6	88,321	38	..	..	1,890	2,300
Sheffield . . . *g*	6	2,316,968	1,139	..	..	14,640	20,686
E. Cowes. . . *e f*	6	16,605	13	150	..	667	802
Worthing. . . .	5	302,301	110	834	4·5	3,910	6,061
Southgate . . *e f*	5	262,661	137	1,537	..	6,497	6,960
Hornsey . . . *e*	5	432,351	212	2,476	..	11,948	10,596
Slough	5	195,441	91	253	1·9	1,320	700
Taunton	4	111,000	102	524	4·6	1,871	1,721
Herne Bay . . .	4	104,495	49	398	5	1,456	789
Hastings . . . *g*	3	..	204	..	..	1,105	..
Pinner	3	168,323	106	664	3·7	1,355	1,634
Woking	1	..	48	398	..	..	..
Ryde . . . . *d*	1	134,808	71	542	6	1,042	854
Oxford	..	390,093	196	..	..	..	..
Totals for 52 companies . . .	..	77,558,641	42,058	333,271	..	3,578,395	2,629,400

a Three employees on the board.
b Percentage is rate on standard wages.
c For year ended March, 1929.
d For year ended June, 1928.
e Share of profit distributed in equal amounts and not in proportion to wages.
f Capital held by employees taken at cost price.
g Figures are not up-to-date.

The Co-Partnership Gas Companies form the largest group of co-partnership businesses within any one trade. The original scheme of the South Metropolitan Gas Company was an extension of the sliding-scale already arranged between the shareholders and customers according to which the rate of interest could only rise as the price of gas decreased. Sir George Livesey arranged that the employees should have a dividend upon wages of three-quarters of 1 p.ct. for each fall of 1d. below 3s. 1d. (1901) per 1000 c.ft. of gas.

After the war the "therm" became the unit of measurement, and many companies adjusted their figures but retained the sliding-scale. The South Metropolitan Gas Company made statutory provision for co-partnership for the first time in its Act of Parliament of 1920. The scheme was also altered. After payment of defined rates of interest, the surplus is to be divided, three-quarters going to the consumers and one-eighth each to capital and labour. The total saving to the consumer through the price of gas being less than 11d. per therm is taken as the consumer's share of profit, and a sum equal to one-third of this (one-quarter of the total) is divided into two equal parts, one to be used for the benefit of the shareholders and the other to go to the Co-Partnership Fund.

The Gas Light and Coke Company gives a profit-sharing dividend on wages and salaries equal to the dividend actually paid on the ordinary shares—a plan adopted to make perfectly clear the essential unity of interest of the two.

Since the war nine companies have started schemes in which the total amount allocated to labour is divided into the requisite number of equal amounts, and each co-partner gets one. The following table gives the "unit" amount in each case for last year:

	£ s. d.
North Middlesex	9 12 0
Brighton	9 9 0
Lea Bridge	10 6 0
Broadstairs	6 13 0
Bishop's Stortford	5 16 0
Cromer	9 0 0
East Cowes	11 11 0
Southgate	11 10 0
Hornsey	9 10 0

In all of these at least half the amount is capitalized, and in some cases the whole. The workers are encouraged to leave the interest to accumulate also, and now some of them receive annually as much in interest as the profit-sharing unit.

GLASGOW'S PROFITABLE YEAR.

The satisfactory results in the year's operations of the Glasgow Gas Department have been attained notwithstanding a fall of revenue from liquid bye-products amounting to £84,000 and a decrease of £10,000 on the sale of coke. It is stated that had the markets for these products remained steady, and if the output had found a ready market, the net profit would have probably been about £370,000. The average price received for gas during the current year was 3s. 7·002d. per 1000 c.ft., as compared with 4s. 4·547d. in 1927-28, which equals a financial drop of £350,647.

The price of gas has undergone five reductions since the Corporation were permitted to raise it to 5s. 2d. in 1927. It now stands at 3s. 6d. per 1000 c.ft., or 1s. 8d. less than during 1927. It may be added that a reduction of 1s. 8d. per 1000 c.ft. equals £700,000, being approximately £2000 per day of a saving to 300,000 consumers.

The outstanding deficit of the Department is now reduced to £199,792, which it is hoped will be entirely wiped out during the current financial year.

The Department, it is officially stated, should be in a position by this time next year to charge gas at the net cost *plus* standing charges (say) approximately 3s. 2d. per 1000 c.ft., always provided that markets for coal, coke, and liquid products remain as at present.

The period covered by the report of the Gas Department is from June 1 of last year to May 31 last. It is stated that the gross revenue amounted to £1,856,211 and the gross expenditure to £1,205,801, to which was added depreciation written off capital assets, £101,987. The balance carried to profit and loss account was a credit of £548,423. The Gas Committee had to meet the following requirements during the year: Annuities on stocks, £17,108; interest on borrowed money, &c., £118,675; and sinking fund, £136,112, leaving a surplus on the year's operations of £276,525. The gross revenue in the previous year amounted to £2,316,331, and the gross expenditure to £1,289,757. With the addition of £99,339 as depreciation written off capital assets, there was left a credit balance of £927,234, compared with a debit against the profit and loss account two years ago amounting to £658,926. A sum of £299,150 was used in meeting various requirements, so that there was a surplus on the previous year's operations of £628,083, as against a deficit two years ago amounting to £946,336.

The sinking fund, with its accumulations, now stands at £2,644,265, of which there has been applied in the redemption of

borrowed money and annuities, £2,630,866, leaving still available for either of those purposes the sum of £13,399.

DECREASED OUTPUT.

The quantity of coal carbonized during the past year was 588,464 tons, as compared with 597,347 tons for the preceding year, a decrease of 8883 tons. The average cost of coal carbonized last year was 17s. 7·87d., being an increase of 2·62d. over the preceding year. The quantity of coal gas made per ton of coal carbonized was 14,199 c.ft., which, with water gas, gave an average of 14,751 c.ft., as compared with 14,546 c.ft. and 15,113 c.ft. respectively per ton for the previous year. The quantity of gas delivered and accounted for during the year amounted to 8,816,687,358 c.ft., as compared with 8,870,593,574 c.ft. for the preceding year, a decrease of 53,906,216 c.ft., equal to 0·608 p.ct. The unaccounted-for gas during the year was 7·2 p.ct., as compared with 7·5 p.ct. for the preceding year, a decrease of 0·3 p.ct. The greatest quantity of gas sent out during the year in 24 hours was 39,164,000 c.ft. The maximum daily make of gas was 37,658,000 c.ft. The net sum realized this year from the sale of coke amounts to £150,399, being £9953 less than that of the preceding year. The total quantity of coke sold this year was 234,947 tons, compared with 295,392 tons for the previous year, a decrease of 60,445 tons. The average price received was an increase of 2·472d. per ton.

The number of ordinary meters in use on May 31 last was 200,378, as compared with 199,283 for the preceding year, an increase of 1095. The number of prepayment meters in use on May 31 last was 111,759, as compared with 110,183 for the preceding year, an increase of 1576, giving a net increase of 2671 meters. At May 31 last there were on loan 177,330 cookers and range fittings, 19,028 grills, 62,998 boiling burners, 56,954 gas fires on hire, 5864 radiators on hire, 1662 water heating appliances on hire—a total of 323,836 as compared with 331,418 for the preceding year.

In view of the continued fall in price of refined tar, the financial results for the year, showing as they do a surplus of £94,691 after paying all working expenses, &c., and £28,012 for rates, taxes, and interest on the book value of the plant, must be regarded as satisfactory. The arbiter's valuation of the tar and liquor is £89,979, so that there is an excess of £4712 over that figure.

GAS UNDERTAKINGS ACT ORDERS.

SECTION 6.

Helensburgh Corporation.

The Corporation shall, from March 1, 1930, charge according to the number of British thermal units supplied, and shall on or before Dec. 1 give notice of the calorific value of the gas which they intend to supply.

Leominster Gas and Coke Company, Ltd.

The Company shall, from Jan. 1, 1930, charge according to the number of British thermal units supplied, and shall on or before Oct. 1 give notice of the calorific value of the gas which they intend to supply.

GAS UNDERTAKINGS ACT APPLICATION.

SECTION 1.

Preston Gas Company.

To authorize the Company to borrow on mortgage of their undertaking, or by the creation and issue of debenture stock, any amount not exceeding the aggregate amount of the paid-up share capital of the undertaking for the time being and of any premiums paid in respect thereof.

RECORD YEAR AT BOSTON.

Large Increase in Sales.

The Annual Meeting of the proprietors of the Boston Gas Light and Coke Company was held on July 11, when the following Directors' report and statement of accounts for the year ended June 30 were submitted:

The net profit for the year amounts to £6670. The balance standing to the credit of the profit and loss account (net revenue), after payment of the interim dividend in February last, amounts to £8436, out of which the Directors recommend the payment of the remainder of the statutory dividend on both classes of shares, *less* income-tax, which with income-tax will absorb £1375, leaving a balance to be carried forward to next year's account of £7061.

The gas rental for the year amounts to £32,874, which shows an increase of £2054 compared with the previous year. The residuals have realized £5962, showing a decrease on the year of £2262.

The number of cookers on hire at June 30 was 4061, being an increase of 141 during the year. There is an increase in the number of ordinary and prepayment meters of 120. The total meters fixed is 2495 ordinary, and 3671 prepayment—in all, 6166.

The CHAIRMAN (Alderman T. Kitwood, J.P.), in moving the adoption of the report, stated that in the last two years the sales of gas had increased by 4 millions of cubic feet, and the number of consumers by 243, while the number of cookers on hire had also increased by 350 during the same period. The sales during the past year constituted a record, and amounted to 150 million c.ft.

As an indication of progress made, 170 new services had been laid on and 350 existing services renewed. The Chairman also particularly wished to record what he thought was admitted on all hands, and that was the success of the town lighting, and the method employed by the Company in lighting the lamps under the control of the Corporation.

INCREASE IN PRICE AT DUNFERMLINE.

Convener's Statement on the Year's Results.

The Dunfermline Town Council on July 8 agreed to an increase of 2d. in the price of the city's gas, which increase will take effect from Aug. 15, the new price being 3s. 2d. per 1000 c.ft.

At the monthly meeting of the Council, Bailie Smith, Convener of the Gas Committee, reported on last year's financial trading, and the estimates for the current year. He said a gross profit of £20,551 was made during the past year, and after paying interest on borrowed money, repayment of sinking fund, and income-tax, there was a credit balance of £723. That balance had been applied to the reduction of their outstanding debit balance incurred during the coal strike of 1926, reducing it to £3543.

With reference to the estimates, it was not an easy matter to forecast for the whole year, having regard to market fluctuations, but for the last few years it was remarkable how close the final result had been to the estimates.

Dearer coal cost £1000 extra. There was an additional £6000 in rates; income-tax amounted to £1500; and there was an estimated decrease of £700 from residuals, all compared with last year; while there was an increase of £1900 in taxation—a very serious item.

During the present financial year the Gas Department expected to pay in rates the sum of £7300; in fact, theirs was the largest contribution of any concern in the burgh.

The Committee required £2798 more than last year, and they gave very serious consideration as to whether the increase should be 2d. or 3d. An increase of 2d. represented a deficit of £566, while one of 3d. meant a credit balance of £552. They felt, however, that they were justified in taking the view that if there was an increase in the price of residuals—which was more than likely—that would wipe out the deficit. They therefore resolved to recommend to the Town Council that the increase be 2d. Even with that increase the price of gas in Dunfermline would compare very favourably with that in other cities.

The minute was unanimously adopted.

SMALL DECREASE IN SALES AT SMETHWICK.

Otherwise Satisfactory Report.

The annual report of the Smethwick Gas Department for the year ended March 31 last shows that, though a slight reduction in the gas consumption amounting to 0·57 p.ct. as compared with the previous year has to be recorded, the year under review has been one of steady progress. In common with other gas undertakings the Department, as foreshadowed in the last annual report to the Council, has suffered severely from the slump in the market prices of residuals; and after taking into account a reduction in revenue from this source amounting to £12,897, the net profit of £7403 for the year can be regarded as eminently satisfactory.

During the year 1167 additional consumers have been served, including 764 taken over in the added area.

The total make of gas amounted to 901,185,900 c.ft. from 49,373 tons of coal carbonized, showing a make of gas per ton of coal carbonized of 17,619 c.ft., or 79·29 therms. The unaccounted-for gas was 3·74 p.ct. The amount of tar extracted per ton of coal was 14·52 galls., and ammoniacal liquor 32·86 galls. The maximum quantity of gas supplied in twenty-four hours during the year was 3,712,000 c.ft.

The net revenue from sales of gas was £130,478—an increase of £1060 on the previous year's figures. The average net price for all gas sold during the year was 3s. 0·118d. per 1000 c.ft., as against 2s. 11·618d. for the preceding year. The total quantity of gas sold and accounted for was 867,011,700 c.ft.—a decrease of 5,009,631 c.ft., or 0·574 p.ct., as compared with the previous year.

The number of meters fixed at the end of the year was: Ordinary meters, 4496; prepayment, 12,991—an increase compared with the previous year of 1173.

FINANCIAL RESULTS.

The gross profit for the year carried to net revenue account is £39,842, as compared with £47,659 for the previous year—a decrease of £7817. In this connection it should be noted that during the year £12,998 has been charged to the reserve fund and £4306 to the net revenue appropriation account. If these amounts had been borne by the revenue account the gross profit would have been reduced to £22,538. The loan charges for the year amount to £25,644; income-tax is £6414; £500 was contributed towards the cost of the Smethwick Corporation Act, 1927; and, after taking credit for sundry items of income, the net profit for the year is £7403.

Of the balance of £24,135 brought forward at the commencement of the year £16,089 was transferred to the reserve fund account, and £4306 has been spent on specific items in accordance with the Committee's resolution, leaving £3740 in the account. Adding to this the net profit of the current year, there is now an available balance of £11,143. A sum of £16,089 was transferred to this fund from the revenue account, and expenditure amounting to £12,998 has been incurred during the year. The fund now stands at £30,298, of which £13,000 is invested. The capital outlay during the year amounts to £9823. Of this amount £5409 has been met without recourse to loans. New loan debt to the amount of £30,963 has been created; but as £11,993 has been redeemed, the outstanding debt now stands at £268,974, or 55·489 p.ct. of the total capital assets shown in the capital account.

STIMULATING COAL EXPORTS AND LIMITING OUTPUT.

Progress of Five Counties Scheme.

The first annual report of the Central Collieries Commercial Association (more generally known as the Five Counties Coal Scheme) reviews the efforts made in the last two years to organize the coal trade in the big Midland, Lancashire, and Yorkshire area, in which the output in 1928 was 44 p.ct. of the total production of Great Britain. The membership of the Association in the first year was 90 p.ct. of the collieries in the area.

The problem before the Association was to restrict output in order to keep prices up and stimulate the export trade. In stimulating exports a signal success is claimed.

The output of all the collieries participating in the scheme in the twelve months before it came into existence was 98,645,128 tons, and their permitted output during the twelve months covered by the report—that is to say, the total output allowed by the quota system—was 93,968,560 tons. Thus the contraction in output for which the Association may be said to have budgeted amounted to 4,676,568 tons, or no more than 4¾ p.ct. Actually the total output of the members was rather less than their permitted output, so that the contraction in production actually achieved was rather greater, amounting in all to 7,631,327 tons. This modest regulation of output certainly arrested the fall in the pithead prices.

If, continues the report, the regulation of output has been successful, the development of the export trade has been altogether striking. A levy of a maximum of 3d. per ton was put on every ton of coal raised in the mines of the members; the proceeds were applied to the payment of a subsidy on all coal exported to foreign destinations. The result is that in the twelve months ended March 31, 1929, the total amount of coal exported from the Humber ports, including Boston and King's Lynn, to foreign destinations amounted to 4,728,534 tons, which compares with a total of 2,566,733 tons for the preceding twelve months. There is, therefore, a gain of 2,161,801 tons in the Association's first year, and this gain is reflected in the totals of coal exports for the whole country.

COLNE GAS DEPARTMENT.

Annual Report.

The expenditure on revenue account was £48,168 and the income £62,440, the gross profit being £14,271. Interest and sinking fund instalment came to £6193, leaving a net profit of £5346, which was transferred to the revenue appropriation account and has been dealt with as follows:

£2000 has been paid over to the rating account, and the balance used in helping to cancel the entire expenditure incurred in laying new gas mains during the past five years, amounting to £5408.

During the year the capital account has not been added to; in fact, the same may be said for the preceding four years, as profits have been sufficient to meet such expenditure.

The policy of paying for all new meters purchased during the year has been continued, the expenditure under this heading being £1349. The book value of the undertaking is £186,868 and the net debt £55,121, so that up to date £131,747 of borrowed money has been repaid.

Manufacturing Results.

The coal carbonized in the horizontal retorts and Tully plants was 12,428 tons, and in addition 722 tons of coke was manufactured into gas in the latter plant. The quantity of gas made per ton of coal was 19,224 c.ft., compared with 19,690 c.ft. for 1928 and 19,733 c.ft. for 1927.

The total quantity made was 252,799,000 c.ft.—a decrease of 5,108,000 c.ft. compared with 1927-28. The maximum make of gas for any one day of 24 hours was 1,103,000 c.ft. on Dec. 10, 1928, while the maximum consumption of gas in any one day was 1,124,000 c.ft. on Dec. 17. The average annual consumption per consumer with ordinary meter was 29,787 c.ft. and per slot meter 22,639 c.ft. The number of consumers at the end of March, 1929, was 8715, of these 3675 having ordinary meters and 5040 slot meters.

Residuals realized £6276 net, against £6366 in 1927-28. Last year, 4552 yards of cast-iron main were laid in the district of supply, the total to date being 52 miles 362 yards.

Public Lighting.

The number of public lamps lighted by gas at the end of March, 1929, was 933, an increase of 29. The gas consumed by them was 21,218,000 c.ft., and the total cost for gas, lighting, extinguishing, cleaning, and repairing was £5808. This, together with the charges for electric lamps, amounting to £323, was charged to the rating account. Of the 933 gas lamps, 630 were lighted by hand and 303 by controllers.

The bulk of the burners have one mantle only, but some have two, three, four, six, and twelve, the total number of nozzles being 1397; and the average number of mantles used per nozzle per annum was 3, being a record since mantles were first adopted for street lighting in Colne.

Wolverhampton Employees' Annual Outing.—The annual outing of the Wolverhampton Gas Company's employees was held on Saturday, July 6, when they made the journey to Southport. Dinner was provided by the Directors, and a very happy time was spent. Mr. A. Coombe, Fittings Superintendent, proposed a vote of thanks to the Directors for their kindness in again providing the means that helped very largely to supply the pleasure. This was supported by Mr. Round.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The markets remain good, especially the Durham gas and coking sections. The position with regard to boats is better, though some of the Northumberland collieries are still having some anxiety. Business for next year is still difficult to negotiate owing to political and other uncertainties; but there is a good deal of inquiry. Business for the rest of this year is still being done on the basis of current prices. Discussions for next year's contracts appear at present to be on the basis of about 16s. f.o.b. for best Durham qualities, which are now round 17s., though some collieries say they are unwilling to close for so far ahead at that figure.

Wear Special gas makes are now firmly quoted at 17s. 6d. f.o.b. and best qualities (Holmside, Boldon class) round 16s. 9d. Seconds are, if anything, rather harder at 16s. to 16s. 6d. Best coking sorts ask up to 17s. 3d., and are very scarce, while seconds are strong at 16s. 9d. to 17s., and quite ordinary sorts get 16s. 6d. Durham bunkers are slightly easier for choice, though the better sorts still ask 16s. 6d. to 17s. 3d., and seconds 16s. Northumberland best screened steams ask 15s. f.o.b.

The gas coke trade is quiet; but the position is considered satisfactory, and 21s. 6d. to 22s. f.o.b. is quoted for shipment.

YORKSHIRE AND LANCASHIRE.

The uncertainty of the subsidy under the Five Counties Scheme continues to make the export trade unsettled. The regular output is fairly well cleared, particularly best hards on export account. Other values remain about normal quotations—for best hards, 18s. 3d. to 18s. 6d. per ton f.o.b.

The industrial fuel trade shows little alteration and the supply seems equal to the demand; but the inquiry for coking slacks is hardly so. The request for house coal continues to decrease. Furnace coke is in quieter demand, although prices are fairly firm.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire.—Hards, Association, bunkers 19s. 3d. to 19s. 9d., export 18s. to 18s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 18s. to 18s. 6d.; washed doubles, bunkers 19s. 3d., export 17s. 6d.; washed singles, export 16s. 6d.; washed smalls, bunkers 16s. 3d., export 15s. 6d.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 12s. 6d. to 13s.; smithy peas, export 19s. to 19s. 6d.

West Yorkshire.—Hartleys (f.o.b.), bunkers 17s. 6d., export 17s. to 17s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 17s. 6d. to 18s.; washed doubles, export 16s. 9d.; washed singles, export 16s.; washed smalls, bunkers 15s. 3d., export 14s. 6d.; unwashed trebles, export 17s. to 17s. 6d.; unwashed doubles, export 15s. 6d.; rough slack, bunkers 13s. 6d., export 11s. 6d.; coking smalls, export 12s.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s. 3d. to 19s. 9d., export 17s. 6d. to 18s. 3d.; cobbles, bunkers 18s. 9d. to 19s. 3d., export 16s. 6d. to 17s. 6d.; washed trebles, export 17s to 17s. 6d.; washed doubles, export 16s. 6d. to 16s. 9d.; washed singles, export 16s. to 16s. 6d.; washed smalls, bunkers 16s., export 14s. 6d.; unwashed doubles, export 16s. to 16s. 6d.; rough slack, bunkers 14s. 3d. to 14s. 9d., export 12s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire.—Screened steam coal, bunkers 17s. to 18s., export 16s. 6d. to 17s.; gas coke, export 21s. to 23s.; furnace coke, export 21s. to 22s.; washed steam, Goole (West Yorkshire), bunkers 18s.; Hull (West Yorkshire), bunkers 18s. 6d.; Hull (South Yorkshire), bunkers 18s. 9d., export 17s. 6d. per ton.

MIDLANDS.

Collieries are offering a firm resistance to pressure for further concessions in prices. Indications are now emerging of an intention to put house coals into stock against the stronger demand which is expected to develop after the holidays. Some of the merchants are moving more rapidly in the matter than they could be induced to do a year ago. This is attributed in part to the course adopted by a number of collieries in limiting their summer quotations to June and July.

Output control is having the effect of maintaining a steady market equilibrium notwithstanding the sluggishness of trade. Slacks and smalls are quite firm. There is no real difficulty in meeting consumptive requirements, neither is there any surplus to weaken the position. Here and there collieries have more large coal on hand than they can readily find buyers for. Stocks are not in such abundance, however, as to threaten market demoralization. Comparatively few spot lots are being pressed.

The suspension of the export subsidy under the Five Counties Scheme has had no very perceptible effect thus far in intensifying competition inland. A few collieries which had withdrawn from the gas coal market have come on again, and have made some odd sales at the ruling prices.

Anxiety is still felt regarding coke more particularly for the blast-furnaces. Only a small portion of the make is uncommitted, and prices round 15s. 6d. to 16s. are named.

British Industries Fair, 1930.—The Eleventh British Industries Fair (Birmingham) will be held from Feb. 17 to 28, 1930, in the enlarged Exhibition Building at Castle Bromwich. The floor area of this building is 400,000 sq. ft. (all under one continuous roof); and on this occasion it is hoped to add a further extension of 65,000 sq. ft.

STOCK AND SHARE LIST.

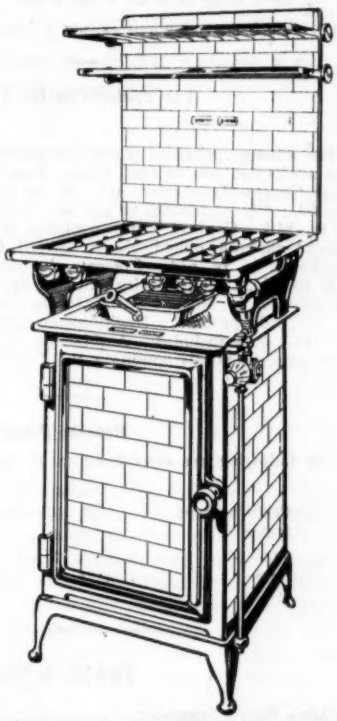
[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends, Prev. Hf.Yr	Dividends, Last Hf. Yr.	NAME.	Quotations, July 12.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C. .	70—75	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	73—76	..	..
1,551,868	,,	Apl. 11	7½	7½	Alliance & Dublin Ord. .	96—99	..	97—97½
374,000	,,	July 11	4	4	Do. 4 p.c. Deb. . .	62—65*	−2	67⅛
522,655	,,	Mar. 7	7	7	Barnet Ord. 7 p.c. . . .	115—118	..	..
800,000	1	May 9	1/4⅛	1/4⅛	Bombay, Ltd.	19/—21/-	..	..
172,500	10	Mar. 7	8½	9	Bournemouth 5 p.c. . . .	13—13½	..	..
500,050	10	,,	7	7	Do. B 7 p.c. . .	12⅜—12⅝	..	..
439,160	10	,,	6	6	Do. Pref. 6 p.c. .	10⅝—11⅛	..	11—11.⅞
50,000	Stk.	July 11	3	3	Do. 3 p.c. Deb. .	54—57*	−1	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb. .	72—75*	−2	..
357,900	,,	Mar. 21	7½	7½	Brighton & Hove 6 p.c. Con.	113—116	..	114—113
371,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	100—103	..	101—102
1,387,500	,,	Feb. 21	5	5	Bristol 5 p.c. max. . . .	82½—90½a	..	..
555,000	,,	Apl. 11	8	7½	British Ord.	117—120	..	119⅜
100,000	,,	June 27	7	7	Do. 7 p.c. Pref. . . .	112—117	..	..
100,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	71—74	..	71½
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	94—97	..	96½
100,000	10	May 30	6	8	Cape Town, Ltd.	8½—9½	..	..
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref. . .	6½—7½	..	..
150,000	Stk.	June 27	4½	4½	Do. 4½ p.c. Deb. . .	71—76*	.	..
686,860	,,	Feb. 21	6	6	Cardiff Con. Ord. . . .	97—100	..	..
267,860	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb. .	99—102	..	..
167,150	,,	Feb. 21	5	6½	Chester 5 p.c. Ord. . . .	88—93b	..	..
98,336	1	May 9	1⅔/-	1⅔/-	Colombo Ltd. Ord.	35/—37/-	..	..
24,496	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref. .	20/—22/-	..	..
275,402	1	Apl. 11	1/9⅜	1/9⅜	Colonial Gas Assn. Ld. Ord.	24/6—26/6	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/6—22/6	..	..
2,073,380	Stk.	Feb. 21	6	7	Commercial Ord.	97—100	..	..
475,000	,,	June 13	3	3	Do. 3 p.c. Deb. .	56—59	..	57
787,550	,,	Feb. 21	7	7	Croydon sliding scale . .	111—114	..	..
408,100	,,	,,	5	5	Do. max. div. . . .	83—86	..	..
542,270	,,	Mar. 7	7	10	Derby Con.	112—117e	..	..
56,000	,,	June 27	4	4	Do. Deb.	68—71e	..	..
200,000	,,	Mar. 7	5	5	East Hull Ord. 5 p.c. . .	73—75	..	..
1,002,180	10	Mar. 21	†4	†7	European, Ltd.	16—18	..	16⅞—17½
19,708,480	Stk.	Feb. 21	5½	5½	Gas Light & Coke 4 p.c. Ord.	18/9—19/3/	..	18/7½—19/1½
2,800,000	,,	,,	5½	5½	Do. 5½ p.c. max. . . .	62½—64½	−½	62½—64
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	76—78	..	76½—77⅝
5,603,830	,,	June 13	3	3	Do. 3 p.c. Con. Deb. .	58—61	..	58½—60⅝
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	97—100	..	99—99⅝
62,500	,,	Mar. 21	7	7	Hastings & St L. 5 p.c. Conv	98—103	..	..
255,740	,,	,,	5½	6½	Do. 5½ p.c. Conv.	80—85	..	..
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd. .	14—15	..	..
219,800	Stk.	Mar. 7	5½	6	Hornsey Con. 5½ p.c. . .	86—89	..	..
1,976,000	,,	May 30	10	20	Imperial Continental Gas.	380—400	+25	360—398
225,180	,,	Feb. 7	8½	8½	Do. 8½ p.c. Red. Deb.	70—73	..	71—72
335,242	,,	Mar. 7	7½	8	Lea Bridge 5 p.c. Ord. . .	117—120	..	..
3,145,907	,,	Feb. 21	6½	6½	Liverpool 5 p.c. Ord. . .	95—96b	..	..
600,000	,,	Mar 21	7	7	Do. 7 p.c. Red. Pref.	104—106b	+2	..
165,786	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap. . .	124—129	..	..
63,480	,,	June 27	3	3	Do. 3 p.c. Deb. . .	53—56	..	..
75,000	5	June 13	†8	†10	Malta & Mediterranean .	5½—6	..	..
392,000	—	Apl. 2	—	5½	Metrop'tn (of Melbourne) 5½ p.c. Red. Deb. . . .	100—102	..	..
641,930	Stk.	May 30	†5	†9	Montevideo, Ltd. . . .	105—108	..	..
2,051,318	,,	Feb. 21	5	5½	Newcastle & Gateshead Con.	17/—17/6d/	−/1½	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref. .	72½—73½d	−1	..
691,705	,,	June 27	8½	8½	Do. 8½ p.c. Deb. .	68—69d	..	..
181,780	,,	Mar. 7	7/1/0	7/1/0	North Middlesex 6 p.c. Con.	108—110	..	..
800,000	,,	Apl. 24	9	7	Oriental, Ltd.	115—120	..	118
205,162	,,	June 27	8	8	Plym'th & Ston'house 5 p.c.	110—113*	..	..
424,416	,,	Feb. 21	7½	8½	Portsm'th Con. Stk. 4p.c. Std.	113—118	..	115—116
241,446	,,	,,	5	5	Do. 5 p.c. max.	82—85	..	83—83½
3,334,454	1	June 27	—	†5	Primitiva Ord.	36/—38/-	+/6	36/—38/-
244,500	100	June 8	4	4	Do. 4 p.c. Red. Deb. . .	92—95	..	..
695,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	79—82	..	..
416,345	,,	June 27	4	4	Do. 4 p.c. Cons. Deb. . .	78—81*	..	..
150,000	10	Mar. 21	6	6	San Paulo 6 p.c. Pref. . .	8½—9	..	..
1,736,968	Stk.	Mar. 21	6½	6½	Sheffield Cons.	108—110a	..	..
95,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb. . . .	74—77a	..	..
90,000	10	June 13	‡4	‡4	South African	4—6	..	4⅞—5
6,809,895	Stk.	Feb. 21	5	7½	South Met. Ord.	104—106	..	104—104⅞
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	108—111	..	109½—111
1,895,445	,,	July 11	3	3	Do. 3 p.c. Deb. . .	57—60*	−1	58⅜
784,000	,,	Mar. 7	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	101⅜
91,500	,,	Mar. 7	8½	8½	South Shields Con. . . .	106½—107½d	..	..
1,543 795	,,	Feb. 21	6½	6½	South Suburban Ord. 5 p.c.	107—110	..	107½—110
468,887	,,	June 27	5	5	Do. 5 p.c. Deb.	95—98	..	..
947,740	,,	Mar 7	5	5	South'mpton Ord. 5 p.c. max.	77—80	..	79—79⅜
191,275	,,	June 27	4	4	Do. 4 p.c. Deb.	70—73	..	74½
179,014	,,	Feb 21	8	8	Sutton Ord.	116—119	..	..
350,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref. .	100—102	..	..
300,000	,,	June 27	6½	6½	Do. 6½ p.c. Red. Deb.	100—102*	..	..
1,002,275	,,	Mar. 7	—	6⅔	Tottenham District Ord. .	108—109	..	107—108
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97—100	..	..
181,255	,,	June 13	4	4	Do. 4 p.c. Deb.	74—77	..	..
289,094	,,	Mar. 7	6⅔	7	Uxbridge, Maidenhead, & Wycombe 5 p.c. . . .	93—98	..	..
88,230	,,	,,	5	5	Do. 5 p.c. pref. .	88—93	..	..
30,000	,,	July 11	9	9	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. .	144—147*	−4	..
355,836	,,	,,	7½	7½	Do. B 5½ p.c. .	122—127*	−3	..
432,585	,,	,,	6.3/10	6.3/10	Do. C and New	100—105*	−2	..
352,000	,,	,,	7½	7½	Do. Wimbledon 5 p.c. .	112—117*	−5	117
98,000	,,	,,	7⅞	7⅞	Do. Epsom 5 p.c. . .	123—128*	−3	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref . . .	87—92*	−3	..
88,416	,,	June 27	3	3	Do. 3 p.c. Deb. . . .	54—57	..	..
284,742	,,	,,	4	4	Do. 4 p.c. Deb. . . .	74—77	..	..
307,500	,,	,,	5	5	Do. 5 p.c. Deb. . . .	93—96	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f*—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.

Governor-General

GAS COOKER



REVOLUTIONARY

IN ITS REFINEMENT
SIMPLICITY
SCIENTIFIC CONSTRUCTION
ECONOMICAL EFFICIENCY
RELIABILITY
CLEANLINESS
and

UTILITY

fitted with
IMPROVED (1929) DESIGN
"ECONOMIC"
AUTO-HEAT REGULATOR
with WHITE CONE Dial

GENERAL GAS APPLIANCES LIMITED

Guide Bridge Manchester.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 15.

Shipments of pitch have practically ceased, and the price for next season keeps steady at 42s. 6d. to 45s. per ton f.o.b.

The price of creosote for export remains 6¾d. per gallon f.o.b., and there is a firmer tone in the home market.

White spirits are unchanged, pure toluole being 2s. 2d. per gallon; pure benzole, about 1s. 11d.; and 95/160 solvent naphtha, about 1s. 5d.

Pyridine bases are about 4s. per gallon.

Tar Products in the Provinces.

July 15.

The average prices of gas-works products during the week were: Gas-works tar, 20s. to 25s. Pitch—East Coast, 40s. to 42s. 6d. f.o.b. West Coast—Manchester, 34s. 6d. to 37s.; Liverpool, 36s. 6d. to 39s. 6d.; Clyde, 36s. 6d. to 39s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3¾d. to 1s. 4½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3¼d. to 3¾d.; low gravity, 2d. to 2¼d.; Scotland, 3½d. to 3¾d. Heavy oils, in bulk, North, 5¾d. to 6d. Carbolic acid, 60's, 2s. to 2s. 0½d. prompt. Naphthalene, £13 to £15. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole . . .	0 10	to 0 11	per gallon at works
Motor ,, . . .	1 5	,, 1 6	,, ,, ,,
90 p.ct. ,, . . .	1 7	,, 1 8	,, ,, ,,
Pure ,, . . .	1 10	,, 1 11	,, ,, ,,

TRADE NOTES.

Kirkless Slurry Separator.

Messrs. Head, Wrightson, & Co., Ltd., of Stockton-on-Tees, have published a booklet dealing with the Kirkless slurry separator; and they will be pleased to send a copy to any of our readers who may be interested in the problem of slurry recovery.

Glue Liquifiers and Conditioners.

Messrs. James Stott & Co. (Engineers), Ltd., of 145, Queen Victoria Street, E.C. 4, have brought out a patent glue liquifier and conditioner, by means of which the gas, steam, or electricity is automatically cut off when the glue is liquid. The glue is kept exactly at the right temperature, and it is impossible for it to cake, burn, or boil over. Full particulars will be forwarded on application.

Messrs. J. H. Robinson & Co. (Liverpool), Ltd.

Messrs. J. H. Robinson & Co. (Liverpool), Ltd., gas meter manufacturers, of 38, Northumberland Park, Tottenham, N. 17, desire to notify their customers and others that from July 15, their London address is: c/o Mr. A. T. Gilbert, 44, Shelbourne Road, Tottenham, N. 17. All goods are to be consigned to Mill Lane, Old Swan, Liverpool.

Premix Gas Plants, Ltd.

Recent installations of "Premix" town gas and air mixture apparatus include those at needle manufacturers (hourly consumption, 40,000 c.ft.), maltsters (3000 c.ft.), textile engineers (units varying from 5000 to 2500 c.ft.), weldless steel tube manufacturers (10,000 c.ft.), electrical works (5000 and 2500 c.ft.), varnish works (2500 c.ft.), paint works (15,000 c.ft.), cork works (10,000 c.ft.), and linen thread manufacturers (5000 c.ft.).

CONTRACTS OPEN.

Test Meter.

The City Manager of the County Borough of Cork invites tenders for the supply of a standard test gas meter. [See advert on p. 154.]

Imperial Continental Gas Association.—It is announced with reference to the issue of £524,000 new ordinary capital stock by this Association at the price of 200 p.ct., that in addition to the fixed rights given to proprietors to apply for £26 10s. of new stock for every £100 of old stock held, a further supplementary allotment at the rate of £2 10s. of new stock per £100 of old stock (or such smaller amount as may have been applied for) will be made to proprietors who have made the requisite application on Form B. Allotment letters will be posted on or about July 20.

The Shirebrook and District Gas Company have recently issued £15,000 6 p.ct. terminable mortgages. The whole of the issue was taken up by the People's Bank, Ltd., of Nottingham.

The Daily Gas "Ad."—With unfailing regularity, there has in every issue of "The Barbados Advocate" for the past four years appeared a new and interesting advertisement by the Barbados Gas Company. Cricket, racing, and almost every activity in the life of the Colony have been utilized by the management in the production of these daily "ads.," by which the Company have established a record for the regular changes; and they are prepared to make this record greater.

Low-Temperature Carbonisation, Ltd.—In view of the expansion of the business, the Directors of Low-Temperature Carbonisation, Ltd., have decided to make an issue of 1,500,000 shares to rank *pari passu* with the existing shares. It is intended to offer these to shareholders registered on July 8 for subscription at par (2s.) in the proportion of one new share for every five held, excluding fractions. Any shares not applied for by the present shareholders will be taken up by the Board at par without commission. Renunciation rights are given, and letters will be split not later than July 18 at a charge of 9d. for each split letter required.

Buckhaven and Leven Gas Price.—At the budget meeting of the Buckhaven and Leven Gas Board, Mr. H. A. Aitken, the Engineer and Manager, presented the annual report. He mentioned that the gas made was 118,875,000 c.ft., an increase of 3 million c.ft. on the previous record, while the gas unaccounted for, always a serious item in mining areas, was 8·59 p.ct., a reduction of 1·5 p.ct. Six years ago it was 14 p.ct. They were still paying the high rate of interest on the main loan contracted nine years ago. By keeping the price at the present rate of 5s. 5d. per 1000 c.ft. they would have a small balance, but he looked forward to an increased consumption, and unless very untoward circumstances took place they could reduce the price by 3d. His recommendation was adopted.

Gas for Industrial Heating was the subject of a lantern lecture at the North-East Coast Exhibition, on July 6, by Dr. C. M. Walter, Engineer-in-Charge of the City of Birmingham Industrial Research Laboratories, at the invitation of the Newcastle and Gateshead Gas Company. Col. W. H. Ritson, Chairman of the Newcastle and Gateshead Gas Company, presided. The use of gas for industrial heating, said Dr. Walter, was increasing rapidly in manufacturing districts for the thermal treatment of raw materials and finished articles, and also for hardening processes. Its great advantages were ease of control, complete combustion, and the exclusion of oxidizing influences of the atmosphere. In Sheffield 40 p.ct. of the gas output was used for industrial heating. In shipbuilding gas was used for the forging of small fittings, brazing of component parts, making flanges of pipes, the heating of plates, and also for riveting. In 1914 only 8·31 p.ct. of the total output of gas was used for industrial heating. In 1929 the figure had risen to 21·5 p.ct.

The London County Council have accepted the offers of the Wandsworth, Wimbledon, and Epsom Gas Company to carcass free of cost to the Council, all the houses on the St. Helier Estate, Morden, for the supply of gas for cooking and heating.

The Gas Committee of the Barrow Corporation have decided to recommend to the Council the centralization of gas production at the more recently erected works at Salthouse, which has vertical retorts, and the scrapping of the old works at Hindpool Road.

The Lytham St. Annes Council have agreed to give rebates to consumers purchasing their gas coke requirements from the Corporation for 12 months. The rebates are: Up to five tons per annum, 1s. 8d. per ton rebate; up to ten tons, 2s. 6d.; over ten tons, 3s. 4d.

The autumn issue of "The Quest," published by the Gas Companies' Association of Australia, is an attractive publication dealing with matters of everyday interest to users of gas and gas appliances. It is well illustrated, and contains much valuable information in connection with the correct management of gas apparatus, together with useful domestic hints and cooking recipes, besides interesting short stories, competitions, and a children's page.

The Clerk (Mr. W. Chorley) informed a meeting of the Porthcawl Gas Committee on July 9 (Mr. R. S. Hayes presiding) that the Ministry had not replied to their communication as to whether the Council had the power to sell or lease the gas-works, and it was decided to communicate further with the Board of Trade. A long discussion took place on the question of purchasing a new fan for the proposed new engine at the gas-works, and the matter was deferred to a Committee who were instructed to visit the gas-works and to report to a special meeting.

At a meeting of the Leamington Town Council recently, it was reported that the Housing Committee had again considered the question of the alleged nuisance caused by noise and the emission of dust and grit from the Leamington Priors Gas-Works. The Town Clerk was instructed to inform the Company that the Committee were not satisfied that all reasonable steps had been taken to remedy the alleged nuisance, and that, unless such steps were taken immediately, they would have no alternative but to advise the Council to lay the facts before the Attorney-General with a view to the institution of proceedings in the High Court.